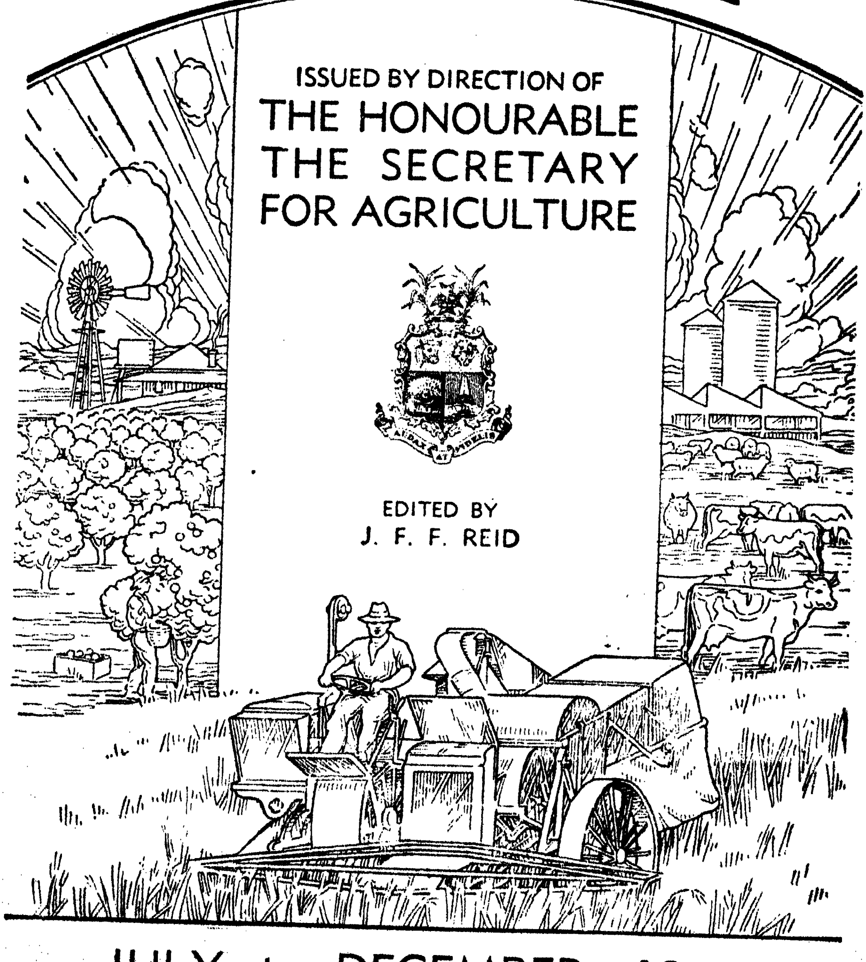
Volume LVI

QUEENSLAND AGRICULTURAL JOURNAL

ISSUED BY DIRECTION OF
THE HONOURABLE
THE SECRETARY
FOR AGRICULTURE

EDITED BY
J. F. F. REID



JULY to DECEMBER, 1941

Vol. LVI. Parts 1 to 6

QUEENSLAND AGRICULTURAL JOURNAL

GENERAL INDEX

D

E

F

G

INDEX TO ILLUSTRATIONS

AUTHOR INDEX

A. H. Tucker, Government Printer, Brisbane.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. **General** Public, **Ten Shillings,** including postage.

Vol LVI 1 JULY, 1941 Part 1

Event and Comment

Co-ordination of National Resources.

IN Great Britain there is an increasing force behind the direction and co-ordination of the national economic effort, and what is being done, or being planned to be done, has a direct interest for Australian primary producers.

If we are going to harmonize our war effort and, after the war, our reconstructional effort, co-ordination among all our services and of all our plans must be regarded as a first and vital essential. Admittedly, the job is not as simple as it seems, but without a clearly defined policy and accurate knowledge waste and overlapping will be very difficult to avoid. Already the British Ministry of Economic Warfare is studying ways and means of managing surpluses of food and raw materials now piling up in different countries. The problems which will certainly face us when the war is over demands our close attention now. It is good, especially in the light of the marketing difficulties with which Australian primary producers are now confronted, to observe the growing feeling in Britain that within the boundaries of the British Commonwealth it should, at least, be possible to consider our problems in relation to the financial and economic needs and resources of the Empire at war, and to minimise any dislocation or disruption of the individual economy of Motherland or Dominion under the stress of war conditions.

An inter-departmental committee is now at work in Britain on plans for mitigating the effects of the war on many of our regular markets. In addition, the problems of future production also are being tackled energetically and, doubtless, effectively. There is ahead, however, the much bigger job of building a scheme of large-scale co-operative planning for the immediate post-war period. "If we can put courage and imagination into our programme of post-war reconstruction, democracy can demonstrate its own strength, its own vitality and superiority to the dictatorships."

What are needed, above all things, to-day are vision, courage, and creative statesmanship. After all, man throughout his history has never been able to go very far without vision, courage, and creative statesmanship.

From Ridge to River—Points in Soil Security.

SOIL erosion is as old as the hills. It has been going on ever since pre-historic man, like a gin with a yam stick, gouged the first furrow and rain turned it into mud or wind blew it away as dust. Wherever soil is laid bare to the weather, erosion starts. This weathering of soil, however, should not be confused with what is called geologic erosion. Geologic erosion goes on where there has been no disturbance of natural cover or environment. With geologic erosion, vegetation holds back the movement of surface soil to a rate that, generally, is no more rapid than the rate at which new soil is formed. "It is so slow that one factor balances the other—that is to say, that soil erosion is balanced by a soil-building process, and changes are so nearly imperceptible that generations of men may never see any difference." When vegetation is ripped off the ground and the soil pulverized with plough and harrow, this natural balance is upset. Continuous cultivation may further disturb the natural balance by taking out of the soil materials which help to hold moisture in the soil. When that happens, soil is removed from the surface much faster than nature builds new soil below, hence what is called accelerated erosion. Examples of soil washing may be seen in every paddock, especially on sloping land in places where the normal rainfall is heavy.

Wind erosion may range all the way from a slight disturbance of the surface soil over a small area to the huge dust storms, which in Western Queensland are called "Bedourie showers," and which blow right across the country and out to sea. This swirling dust, according to soil science men, is composed of the richest and finest particles of soil. "The action of the wind on soil is something like the action of a sieve—the lighter particles go up in the air and the coarser particles pile up as soil drifts or sand drifts."

"Up-and-down-farming" is one of the quickest ways of losing soil. And so with our waking up to what soil erosion means, both to individual properties and Queensland at large, we are now devising or adopting or adapting all sorts of means of saving our soil, and, perhaps, saving our soul as well, for to wilfully fail in our duty as trustees of a natural and national heritage to those who come after us is surely a sin against the whole community.

Among these means of saving soil are contour furrowing, strip farming, rotational and cover cropping, the growing of wind breaks, regrassing, grassing of watercourses, and proper pasture management. All these methods of soil security—the prevention of the washing of real wealth from ridge to river and thence to the sea, and the fertility

which goes, or blows, with the wind will be well illustrated with landscape models made to scale at the Brisbane Show next month. Every farmer who is coming down for the Show should make a point of seeing these model landscapes; and, at the same time, it would be well worth while having a look at the models of all sorts of silos, from the cheaply constructed trench to the more elaborate overhead systems. From these exhibits it will be possible to pick up many wrinkles and gadgets that can be applied at no great cost on the farm. The soil is really the farmer's working capital—capital which, obviously, we cannot afford to squander.

Restoring Life to the Landscape.

WHEN we come to think of it, soil destruction and wild life destruction were born of the same process. In our pioneering zeal and enthusiasm we, in many cases, cleared every stick of timber off our land, either with the axe or firestick, and in many other ways disturbed the balance of nature by unwise or injudicious or thoughtless exploitation. As for wild life—especially valuable native insect-eating birds—by chopping down or ringbarking heedlessly every tree, we destroyed their feeding and breeding places, and so made easy the multiplication of insect pests, blowflies, grasshoppers, and the like, which to-day are costing the man on the land millions in hard cash every year. Fortunately, it is repeated, we are waking up to all these things, and are applying more intelligence and judgment in the development or proper use of our land heritage, and where it has been lost, we are "restoring life to the landscape." After all, the wealth of Australia is rooted in the soil, and it is our job to see that that wealth is not lost by stealth—the stealth of wind and water uncontrolled. We can no longer stand idly by while our farms go down the creek by instalments during every heavy shower of rain.

Grow More Cotton.

MORE cotton is a war-time necessity and, unlike butter, sugar, and wheat, and other crops of which we grow an exportable surplus, cotton-growing has points about it that appeal to every farmer, and they are a guaranteed price and a guaranteed market. The market is guaranteed in so far as our present production falls far short of the supply required by Australian spinning mills. Farmers in the recognised cotton districts, of course, know all this, but, in many cases, the difficulty is sufficient soil moisture to ensure a crop. A guaranteed market is all right, but they naturally ask what about a guaranteed crop? In answer to that, the Queensland Government is ready to help a farmer with suitable cotton country to get an irrigation outfit and install it for him. The cost is kept down to the lowest limit possible. There are no overhead charges to pay and the price of the outfit is the actual cost, plus the cost of transport and installation. The money for buying the plant is lent without interest and repayment is spread over ten years—it is really a charge against the annual crop. The only other security required is in the irrigation outfit itself. In return, a farmer is required to grow and irrigate about 10 acres of cotton every year. He must, of course, have enough water for irrigation and his own power plant—tractor or otherwise. After providing for the cotton crop, a farmer may, of course, use his irrigation outfit for watering any other crop.

To any farmer interested, the Bureau of Rural Development, Brisbane, will send full particulars. The big thing is to grow more cotton as a war-time necessity.

The Establishment of a Home-made Cuprous Oxide Mixture as a Citrus Fungicide in Southern Queensland.

F. W. BLACKFORD, M.Sc.Agr., Assistant Research Officer.

THE problem of disease control in citrus orchards in Queensland has become increasingly serious as the development of the industry necessitated more and more attention being given to efficiency in production. The four most important diseases with which growers have to contend are black spot (*Phoma citricarpa* McAlp.), melanose (*Diaporthe citri* (Faw.) Wolf), scab (*Sphaceloma fawcettii scabiosa* Jenkins) and brown spot of the Emperor of Canton mandarin (*Gloeosporium* sp.). These have proved amenable to fungicidal spray schedules involving the application of Bordeaux mixture with or without supplements. Orchardists, however, have been loth to use this spray, claiming that severe adverse effects to the trees follow its application.

The unpopularity of Bordeaux mixture was emphasized in the case of brown spot as fungicidal treatment was necessary even more than for the other diseases mentioned. When this disease was first recorded from Queensland, Bordeaux mixture was recommended for its control but growers had little success with the spray. An investigation into the control of the disease was accordingly commenced in 1931 (Mandelson and Blackford 1938), but the work had not proceeded very far before it became evident that serious disadvantages were associated with the use of Bordeaux mixture. In an attempt to find a substitute for this spray various mixtures were tried out. The one showing the most promise of value was prepared from bluestone, molasses and caustic soda, according to a formula which had proved successful in controlling blue mould in tobacco seedlings (Mandelson 1933). Mandelson and Blackford (1938) showed that this mixture was quite satisfactory for the control of brown spot and that its use seemed to be unattended by complications which usually followed applications of Bordeaux mixture. Following this initial success, further investigations were carried out by the author with a view to obtaining a reliable estimate of the value of home-made cuprous oxide mixture as a standard spray for inclusion in an orchard pest and disease control programme. This involves the consideration of three aspects of the use of the spray, viz.:—

(1) the phytocidal effects of the spray;
(2) the fungicidal effects;
(3) the interaction of copper sprays with various materials used for pest control.

These three aspects form the main consideration of the present paper.

MATERIALS AND METHODS.

All the field experiments reported here were carried out with citrus trees kindly placed at the disposal of the Department by orchardists in the various districts. Unless otherwise stated, all sprays for the control of insect pests and mites were chosen and applied at the discretion of the orchardist. Cultivation, pruning and manuring were also carried out according to his normal programme.

Throughout the work the randomised block type of layout was used, a single tree representing a plot. Where the interaction between treatments was investigated, for example in copper spray fumigation experiments, the split plot layout was adopted.

Materials sold as commercial spray ingredients were used to prepare the various mixtures. In the case of Bordeaux mixture, hydrated lime of a good quality was used in all cases. In applying the sprays, use was made of the power outfit in the possession of the orchardist, the pumps delivering the spray at a pressure of approximately 150-200 lb. per square inch. Spray rods at least six feet long were used, the nozzles delivering a fine mist which was comfortably applied to the tops of the trees.

For the purposes of fumigation, medium weight calico sheets were used. A commercial form of calcium cyanide in the form of a fine dust, was the fumigant, the charge being scattered under the tent by hand. Dosages of the fumigant were determined by measuring the height and diameter of the tree and then referring to the dosage chart supplied by the manufacturers. The period of fumigation was 45 minutes.

In taking leaf samples for the estimation of the spray residue, fifty leaves from the outer canopy were selected at random from points round the tree at shoulder height. Leaves fully expanded at the time of spraying and approximately the same age were chosen to avoid the error introduced by the growth of the lamina after spraying. Discs, approximately 1.6 cm. in diameter were punched from the centre of the leaves. This eliminated the heavy concentrations of spray residue often found at the tip and stalk ends of the lamina. One disc from each of the fifty leaves was taken for estimation, the leaf surface, both sides included, being approximately 200 sq. cm.

The estimations of copper in the spray residue were made by Mr. J. L. Foran, of the Agricultural Chemist's Branch, according to the method outlined by Hoar (1937). Both the pyrophosphate and citrate methods were used, consistent results being obtained. At the outset, wet oxidation with a mixture of nitric and sulphuric acids was employed. Similar results were obtained by the dry ashing (without flame) process, so that use was made of this method for the majority of the determinations, a good white to grey ash being obtained in all cases.

CHEMICAL COMPOSITION OF THE SPRAY.

The spray mixture used in the series of experiments described in this paper is similar to that recommended by Mandelson (1933) for the control of blue mould of tobacco seedlings. The formula is a slight modification of that suggested by Raleigh (1933) for the control of Irish blight of potatoes. The method of preparation of the mixture involves the use of two solutions.

Solution A.

1 lb. bluestone (copper sulphate, pentahydrate).

1 pint molasses.

4 pints water.

Solution B.

5 oz. caustic soda.

3 pints water.

Solution B is poured slowly into solution A, stirring vigorously until thoroughly mixed. A heavy precipitate, at first dirty green in colour, is formed. On allowing the mixture to stand—usually ten days to a fortnight is necessary—the colour of the precipitate changes to brownish yellow. For use this stock solution was diluted to the strength required, usually 3 gallons in 40 gallons.

When caustic soda is added to copper sulphate so as to obtain a neutral solution, a pale-blue precipitate of cupric hydroxide is formed. In two to three hours, this precipitate decomposes to the black cupric oxide. The addition of glucose to the copper sulphate solution before the caustic soda is mixed with it prevents this rapid decomposition. In this case, the precipitate when first formed has a greenish tinge and slowly changes to a yellow cuprous oxide similar in appearance to that obtained when molasses is used. This change usually requires ten to fourteen days.

If the mixture is allowed to stand for a further fortnight it is found that much of the cuprous oxide has been redissolved to give a greenish-blue solution. Coincident with an increase in the amount of soluble copper is an increase in the hydrogen ion concentration, mixtures at first neutral becoming acid. The addition of caustic soda to this solution reprecipitates cuprous oxide.

Qualitative tests have shown this soluble copper to be in an organic form. Its value as a fungicide is unknown. It probably does not remain in the soluble form on the leaf as it has been shown that on clean microscope slides it changes to yellow insoluble cuprous oxide on drying. It has also been shown that this soluble form of copper may be eliminated by slightly modifying the formula and using honey instead of molasses as a source of reducing sugars. A little more caustic soda is added, just sufficient to neutralise the acid oxidation products of the glucose. Also, the variation in the content of reducing sugars is less in honey than in molasses, so that the theoretical amount of reducing sugars necessary for use in the mixture can be more closely approximated.

The most suitable proportions of the various materials used when honey is the source of reducing sugars in the formula have not been fully determined. The following has much to commend it:—

Solution A.

9 lb. bluestone.

5 gallons water.

Solution B.

3 lb. caustic soda.

1 pint honey (70-75 per cent. reducing sugars).

4 gallons water.

This formula makes up 9 gallons of stock solution which may be used at the same strengths as previously recommended for the molasses mixture.

A comparison of the cost of cuprous oxide mixture and that of Bordeaux shows very little difference. Taking current prices for materials, the cost of 40 gallons of spray would be—

	s.	d.
Bordeaux mixture, 3-2-40	1	1½
Cuprous oxide mixture, molasses formula (3-40)	1	5½
Cuprous oxide mixture, honey formula (3-40) ..	1	5½

From the above discussion it is evident that copper is present in the spray mainly, and perhaps wholly, as cuprous oxide, and, from general observations it would appear that it is not present as a true colloid. Hence the term "home made cuprous oxide mixture" more appropriately describes the spray than "colloidal copper."

COMPARISON OF THE PHYTOCIDAL EFFECTS OF BORDEAUX AND HOME-MADE CUPROUS OXIDE MIXTURES.

Although Bordeaux mixture has held pride of place as a fungicide for many years, there have, of late, been many reports of plants being adversely affected by this spray. This is particularly the case in respect to citrus. In Florida it was found (Rhoads 1929, Winston, Bowman and Bach 1927) that when Bordeaux mixture was applied early in the season for the control of melanose, an increase in scale infestation of the trees resulted. It was considered that this was due to the effect of the fungicide on the entomogenous fungi which otherwise exert some degree of control of these pests. Fawcett (1936) described a slowly appearing type of injury which followed applications of Bordeaux mixture in summer. The injury was not permanent, trees on recovery seeming to be slightly more vigorous than before. McCleery (1939) in New South Wales described serious chronic injury following the use of Bordeaux mixtures of 6-6-50 and 6-6-80 strengths. This injury was found particularly in orchards in which the trees were in a condition of poor growth. The fruit was reduced in size, the texture of the rind was poor, and the colour at maturity inferior. The growth of the trees was hardened and the trees showed an increased tendency to leaf fall. Associated with these adverse effects on the health of the trees was a marked increase in scale infestation.

In early experiments with Bordeaux mixture of 4-4-40 strength in Queensland, Mandelson (unpublished report) noted this effect on the growth and vigour of the trees, together with the increased scale infestation and the deterioration of fruit quality. This injury was more marked the later in the season the spray was applied. In later experiments (Mandelson and Blackford 1938), similar though less apparent injury followed the use of 3-2-40 Bordeaux mixture in a four-spray schedule. However, four sprays of home-made cuprous oxide mixture used under identical conditions did not show the same detrimental effects. A direct comparison along these lines between the effect of this fungicide and Bordeaux mixture was then thought necessary. Experiments to obtain information on the effect of copper sprays on red scale infestation were carried out in the 1937-38 and 1938-39 seasons.

Experiment 1 (1937-38).

In an experiment designed primarily to investigate the compatibility of various scalicides with cuprous oxide and Bordeaux mixtures,

some of the trees were not sprayed with a scalicide until late in the season and others received no scalicide at all. Just prior to the application of the scalicide, estimations of the scale infestations of the trees were made.

The treatments compared were—

Treatment A. Cuprous oxide mixture (3-40), applied in late September, late November, and late February.

Treatment B. Bordeaux mixture (3-2-40), applied in late September and late November, and cuprous oxide mixture (3-40), applied in late February.

Treatment C. No sprays.

In estimating the density of the scale population, counts of the number of scales on five twigs of similar size, selected at random from the trees, were made, together with similar counts on five fruit, also selected at random. These counts are shown in Table I.

TABLE I.

COUNTS OF SCALE INSECTS ON TWIGS AND FRUIT, 1937-38 EXPERIMENT.

Treatment.	Block 1.			Block 2.			Block 3.			Block 4.		
	Twigs.	Fruit.	Total.	Twigs.	Fruit.	Total.	Twigs.	Fruit.	Total.	Twigs.	Fruit.	Total.
A ..	2	72	74	69	1,020	1,089	34	10	44	46	916	962
B ..	264	289	553	98	2,644	2,742	65	802	867	38	1,939	1,977
C	81	568	649	49	604	653	131	51	182	60	377	437

These results are very variable, but there is some indication that the cuprous oxide mixture did not increase the density of the scale population to the extent that Bordeaux mixture did.

Experiment 2 (1938-39).

In this season an experiment was set out in the Howard district using Late Valencia orange trees. Two spray schedules consisting of (*a*) three applications of cuprous oxide mixture (3-40), and (*b*) three applications of Bordeaux mixture (3-2-40) were compared, unsprayed trees being included as controls. At the request of the orchardist, just prior to the application of the copper sprays the trees were sprayed with white oil (1-40) to reduce scale infestation to a minimum, but no further scalicides were applied to the trees until all figures relating to scale infestation were obtained. Twenty-four trees were included in the experiment, the layout of which conformed to that of a randomised block of three treatments with eight replications.

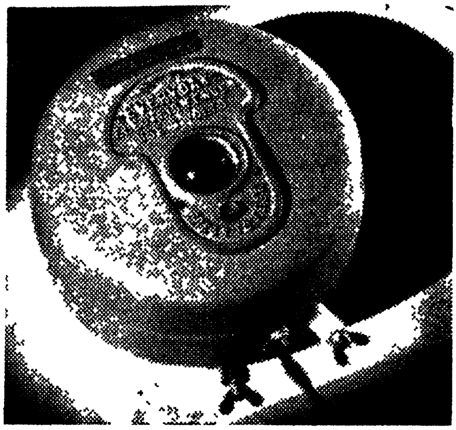
Approximately three months after the third application of the fungicides, an estimation of the scale populations of the trees was obtained. First, a comparison between the density of the scale infestation of fruit from the trees in each block was made. In six of the blocks these showed a slight increase on trees receiving Bordeaux mixture and cuprous oxide mixture, though no differences between the respective

Fence the Modern Way

with

ONE

Wire!



This Everyday Electric Fencer stops the most persistent fence breakers After one or two contacts with the wire the most stubborn animal will learn to respect this fence, and will never again attempt to break through All you do is to erect ONE wire, attach the Everyday and the job is done Saves fencing costs, saves labour, enables you to fence your property in a fraction of the time Write for illustrated pamphlet giving all details

EVERYDAY

ELECTRIC FENCER

Operates on 6-Volt Dry or Storage Battery—Charges up to 20 Miles of Fence—Saves Wire and Erection Costs

£8/10/0 Battery Extra 37/6

Hot Water At The Turn Of a Knob!

ENSIGN KEROSENE OPERATED

Bath and Sink Heater!

The most efficient water heating system for country homes Supplies up to two gallons of hot water per minute Fitted with pilot light which brings heater into action instantly you turn the knob. Easy to fit, odourless, safe, no pumping or pre-heating required. Offered in gleaming chromium finish.

£12/10/0 Complete with Shower

Write for Further Details to—

TRACKSON BROS. PTY. LTD.

157-159 ELIZABETH STREET BRISBANE

sprays could be detected. Of the other two blocks, one showed no difference between the plots, and in the other the tree sprayed with Bordeaux mixture showed a more dense infestation than either the tree sprayed with cuprous oxide mixture or the control.

Subsequently, 100 fruit were selected at random at shoulder height from all sides of each tree and classified as clean or scale infested. The percentage of scale infested fruit averaged out at 47 for the trees sprayed with Bordeaux mixture, 41 for those receiving cuprous oxide mixture, and 21 for the controls.

In this experiment, therefore, cuprous oxide mixture increased scale infestation almost as much as did Bordeaux mixture. However, the infestation over the whole plot was light, and though the differences between the scale populations on sprayed and control trees were noticeable, these were very small. The trees included in the experiment were in vigorous healthy growth when the sprays were applied, and it is probable that greater differential effects would have been obtained if weaker trees had been used.

Apart from the scale infestation, no adverse effects on the fruit or the growth of the trees were noted on the trees sprayed with either Bordeaux mixture (3-2-40) or cuprous oxide mixture (3-40). This statement holds for all cases where no more than one season's application of three sprays has been made. Past experience suggests that Bordeaux mixture even at this strength would not be so free from blame if the applications were repeated in successive seasons. On the other hand, in a small area of mandarin trees used in experiments for the control of brown spot, certain trees have been receiving at least three and sometimes four applications of cuprous oxide mixture (3-40) each season for five successive years without any adverse effects appearing. In fact, the growth of the trees seems to show improvement, though this may be attributed to the control of the leaf and twig infections of the disease. Reports from orchardists in various districts who have used the spray all confirm this lack of injurious effects, and cuprous oxide mixture has achieved considerable popularity on this account.

Recent work carried out by Horsfall (1938, 1939) and his collaborators throws some light on this phase of the use of cuprous oxide mixture. From their investigations of the injurious effects of Bordeaux mixture on tomatoes and cucurbits, they came to certain conclusions—

(1) Injury increases with increase in spray load.

(2) At pH 7, approximately, least injury occurs, the amount increasing with increasing acidity (immediate burning following the use of an insufficiently neutralised mixture) or alkalinity.

(3) Hydrated lime has an adverse effect on plant growth when used in a spray.

The injury mainly considered was the chronic type, including dwarfing, leaf curling, and hardening, rather than the acute type which occurs when insufficiently neutralised sprays are used. It is the former type which is also the most serious concern in the use of fungicides for citrus disease control.

Considering cuprous oxide mixture from these aspects there is first the question of spray load. Spray load is defined as the amount of material applied to a leaf, and for the sake of comparison a convenient

figure is obtained by summing up the weights of the constituents of the spray. Thus the figure for Bordeaux mixture (3-2-40) is 5 lb. per 40 gallons. In the same way the spray load for cuprous oxide mixture (3-40) would be 4 lb. (approximately) to 40 gallons, i.e., less than the Bordeaux mixture of the same copper content. However, it must be pointed out that all the material in the Bordeaux mixture is insoluble in water, whilst it is only the cuprous oxide which remains insoluble in the cuprous oxide mixture; the rest, sodium sulphate and various organic compounds from the molasses, are soluble. The greater part of these soluble compounds would be removed by the first shower of rain, so that a true figure for the spray load for this mixture would be slightly less than 1 lb. per 40 gallons. Thus the cuprous oxide mixture has only one-fifth the effective spray load of the Bordeaux mixture of the same copper concentration. In the light of overseas work it would be natural to expect a considerable reduction in injury from the cuprous oxide mixture on this score.

It is well known that trees growing near dusty roads or frequently used driveways in the orchard, where they become coated with a heavy dust layer, comparable with a heavy spray load, are less vigorous than trees further removed from the source of the dust. Scale infestation is heavier and dieback and hardening of the growth are found, symptoms similar to those associated with the use of Bordeaux mixture.

Regarding the pH of the spray, the formula for the cuprous oxide mixture has been so calculated as to provide a spray as near to neutral as possible. In correspondence with the writer, Mr. F. C. McCleery, of the New South Wales Department of Agriculture, reported that cuprous oxide mixture made up according to the formula suggested by Raleigh (1933) caused severe injury to the bark of terminal twigs and fruit of Late Valencia orange trees when three or four applications were made. It is interesting to note that in similar experiments under Queensland conditions three applications of the neutral mixture to Late Valencia orange trees in the Howard district caused no injury of this type in two different seasons. The mixture suggested by Raleigh (1933) contains 6·4 oz. of caustic soda per lb. of bluestone, which is 1·4 oz. in excess. Although the climate, district, and vigour of the trees must be considered also, this difference between the injury caused by the neutral and alkaline sprays is noteworthy.

A reduction in the concentration of the lime in the mixture may account in part for the reduction of injury caused by 3-2-40 Bordeaux mixture when compared with the 4-4-40 strength. The elimination of the calcium hydroxide entirely from the spray formula must be considered a factor in the reduction of injury when cuprous oxide mixture is used. Calcium is present in the molasses, but it is in the form of salts which are not considered harmful.

FUNGICIDAL VALUE OF CUPROUS OXIDE MIXTURE.

The first recorded use of sugar as a supplement for copper sprays is that by Perret (1892). Part of the copper was converted to the soluble copper saccharate, which he claimed increased the fungicidal value of the original Bordeaux mixture. Good results were obtained with the control of disease and the mixture was harmless to the plant. Barth (1925) also found this combination superior to Bordeaux mixture for the control of mildew. Doran (1923) reported that the addition of

4 lb. of sugar increased the toxicity of Bordeaux mixture (4-2-50) to spores of *Venturia inaequalis* four times, Perret's formula being only twice as effective.

Barth (1925) used molasses as a source of sugar in Perret's mixture without affecting its efficiency in any way. Holland, Dunbar, and Gilligan (1929) pointed out that the reducing sugars present in molasses would convert some of the copper compounds to cuprous oxide, then regarded as an inferior fungicide.

The first detailed investigation of the fungicidal value of cuprous oxide was made in 1932 by Horsfall, who used it successfully as a seed dust for combating damping off. This work was continued further, the material being used as a spray, which provided good control of several foliage diseases (Horsfall, James, and Suit, 1938). These results have since been confirmed by others.

In a comparison between the fungicidal properties of cuprous and cupric oxides it was found (Anderson, Kadow, and Hopperstead, 1937) that cuprous oxide was somewhat superior to cupric oxide as a seed treatment for the control of damping off. Rather varying results were obtained (Marsh, Martin, and Munson, 1937) in a comparison of these two materials for the control of potato blight. Further investigation (Horsfall, Marsh, and Martin, 1937) showed that the fungicidal properties of cuprous oxide were profoundly modified by variation in particle size—the smaller the particle size the greater the fungicidal activity. Heuberger and Horsfall (1939) have since shown that the colour of cuprous oxide is a good indication of particle size, the yellow having the smallest and red the largest. The fungicidal activity decreased as the colour changed from yellow to red. They place the type of spray discussed in this paper at the yellow end of the series.

There has been very little work done in connection with the use of cuprous oxide as a fungicide to replace Bordeaux mixture. Laboratory investigations by McCallan and Wilcoxin (1938) of the toxicity of sprays to germinating spores led them to believe that Bordeaux mixture was slightly superior to cuprous oxide. Kuntz (1938) reports some success with a cuprous oxide spray for the control of melanose and scab of citrus in Florida. Cuprous oxide was first used for the control of a citrus disease in Queensland in 1933-34 by Mandelson and Blackford (1938) when it was included in experiments for the control of brown spot. It was used again the following year—not so much on account of any outstanding fungicidal efficiency shown but because of its favourable comparison with Bordeaux as regards its phytocidal effects. This time there were indications that cuprous oxide mixture (3-40) was as efficient a fungicide as Bordeaux mixture of the same copper content. A third experiment introduced a three-spray schedule, which proved successful in controlling the disease. This is of particular importance in connection with cuprous oxide mixture, since, as will be shown later, it makes possible fungicide-scalicide combinations.

Observations made while counting the fruit from these experiments suggested that black-spot infection was also being reduced by the applications of cuprous oxide mixture. As this spray showed promise of possessing advantages not found in Bordeaux mixture, an investigation of its efficiency as a fungicide for the control of important citrus diseases other than brown spot was considered necessary. This was accordingly done, and the results obtained with respect to the different diseases will now be discussed in turn.

BROWN SPOT.

The earlier work in the control of this disease with cuprous oxide mixture has already been discussed (Mandelson and Blackford, 1938). The accumulated results showed that this spray applied at half blossom fall, eight weeks later and in late February was effective in controlling the disease. In the 1937-38 season a final comparison was made between cuprous oxide and Bordeaux mixtures.

The experiment was set out primarily to investigate the effects of the application of various scalicides applied after cuprous oxide sprays. However, as it also served as a means of comparison between cuprous oxide and Bordeaux mixtures, the matters having relation to this question will be discussed here.

The three-spray schedule developed previously was used. The fungicidal treatments were—

Treatment A. Three applications of cuprous oxide mixture (3-40).

Treatment B. Two applications of Bordeaux mixture (3-2-40), followed by an application of cuprous oxide mixture (3-40).

Treatment C. Controls—no fungicidal sprays.

Cuprous oxide mixture was used as the third spray in treatment B, as it was considered best to avoid the possibility of adverse phytocidal effects following a third application of Bordeaux mixture. Scalicide treatments are discussed later under the section dealing with compatability of sprays.

Thirty trees were included in the experiment and these were divided into ten blocks, the experimental layout conforming to that of a randomised block of three treatments with ten replications.

At picking time counts of diseased and healthy fruit, including fallen fruit, were made in the same way as in the previous experiments. The results are shown in Table II.

TABLE II.

BROWN SPOT EXPERIMENT, 1937-38—PERCENTAGE OF DISEASED FRUIT PER PLOT.

Treatment.	Blocks.										Average.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	
Cuprous oxide mixture (three sprays) ..	4·4	5·1	2·5	3·3	6·4	4·3	4·2	4·0	6·0	2·4	4·3
Bordeaux mixture (two sprays) + cuprous oxide mixture (one spray) ..	5·0	2·5	2·9	4·3	7·4	4·0	3·3	4·9	5·3	7·0	4·7
Controls (no sprays) ..	22·4	10·6	15·4	23·3	14·2	18·2	12·9	15·2	26·0	8·3	16·6

From these results the following conclusions may be drawn:—

(1) Cuprous oxide mixture is as effective for the control of brown spot as Bordeaux mixture of the same copper content (i.e., 3 lb. copper sulphate to 40 gallons).

(2) The three-spray schedule provides effective control of the disease.

BLACK SPOT.

The spray schedule previously recommended for the control of black spot consisted of two applications of Bordeaux mixture 3-2-40 at (*a*) half to three-quarters petal fall, and (*b*) six to eight weeks later. Under Queensland conditions it has been shown in field experiments carried out by Mandelson (1933) that although the fruit is susceptible to infection at all times from setting to picking, this schedule will provide good control of the disease even in areas of very heavy rainfall such as is met with on the Blackall Range at Mapleton. However, few orchardists availed themselves of this method of control and investigations of the effectiveness of cuprous oxide mixture were commenced in the hope that a more appreciated measure would be available.

Experiment 1 (1937-38).

The first experiment was carried out in the Howard district using Late Valencia orange trees. Cuprous oxide mixture (3-40) was compared with Bordeaux mixture (3-2-40) in a two-spray schedule. As cuprous oxide mixture does not adhere as well as Bordeaux, it was considered that a third spray of this mixture might be necessary to ensure a sufficient cover after washing by rain. Accordingly a third application, corresponding with the third application in the brown spot control schedule was included. The spray schedules used are shown in Table III.

TABLE III.

BLACK SPOT EXPERIMENT, 1937-38—SPRAY SCHEDULES.

Treatment	Late September.	Late November.	Late February.
A	Cuprous oxide	Cuprous oxide	Cuprous oxide
B	Bordeaux	Bordeaux	..
C	Cuprous oxide	Cuprous oxide	..
D	..	Controls, no fungicidal spray	

Twenty trees were available for the experiment, and these were divided into five blocks, the layout conforming to that of a randomised block of four treatments with five replications.

At picking time the diseased fruit were separated and classified into three grades of infection. Plate 1 illustrates the method of grading for degree of infection, A being a typical severely infected fruit, B and C being the greatest amount of infection permitted in the moderately and slightly infected grades respectively.

The figures for these counts are shown in Table IV. For the purpose of summary and analysis the slightly infected fruit were included with the healthy, the other two grades being combined as diseased.

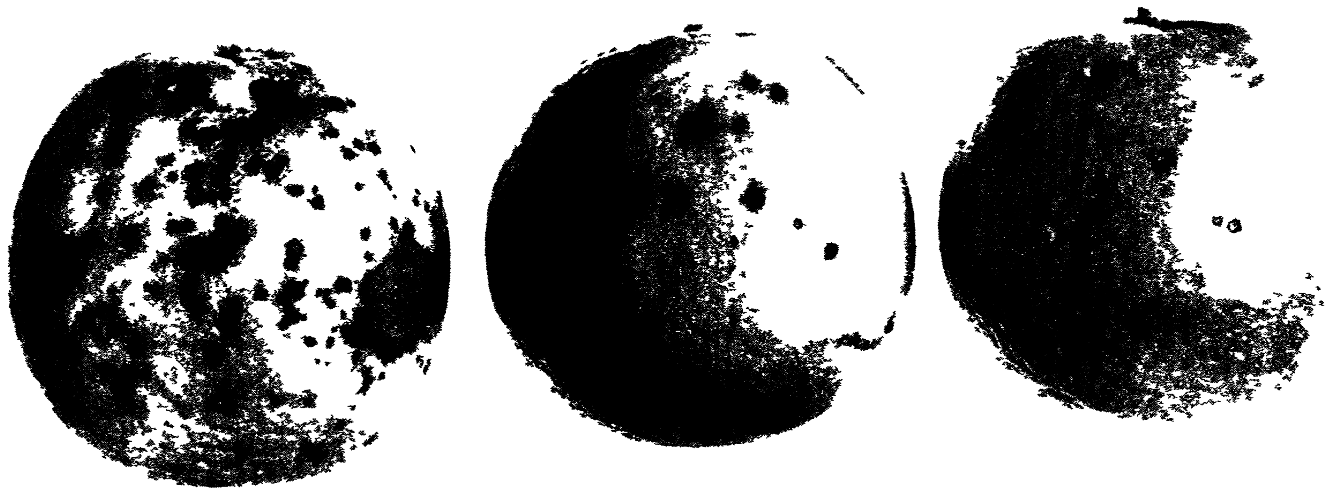


Plate 1

BLACK SPOT—Degrees of Infection

A Typical severely infected fruit

B Greatest amount of infection permitted in moderately infected grade

C Greatest amount of infection permitted in slightly infected grade

TABLE IV.

FRUIT COUNTS, 1937-38—BLACK SPOT EXPERIMENT.

Treatment.	Healthy.	Diseased.			Total Healthy.	Total Diseased.	Percentage.	
		Slight.	Moderate.	Severe.				
A	650	..	..	..	650	..	..	
A	684	2	6	3	686	9	1·3	
A	1,044	6	4	..	1,050	4	0·4	·7
A	960	4	7	3	964	10	1·0	
A	882	4	2	5	886	7	0·8	
B	1,100	1	..	..	1,101	..	..	
B	950	2	1	..	952	1	0·1	
B	835	3	3	..	838	3	0·4	·3
B	756	1	1	3	757	4	0·5	
B	791	8	..	5	799	5	0·6	
C	674	10	..	3	684	3	0·4	
C	834	10	10	5	844	15	1·7	
C	433	..	..	2	433	2	0·5	·7
C	721	2	..	2	723	2	0·3	
C	832	14	2	5	846	7	0·8	
D	656	26	15	3	682	18	2·6	
D	863	26	59	71	889	130	12·8	
D	1,058	30	42	36	1,088	78	6·7	8·2
D	826	25	54	45	851	99	10·4	
D	900	56	56	32	956	88	8·4	

The results of this experiment suggest the following conclusions:—

(1) Cuprous oxide mixture is as effective for the control of black spot as Bordeaux mixture of the same copper content (3 lb. bluestone to 40 gallons).

(2) Under the conditions of the experiment, the third application in treatment A was not necessary. As very heavy rainfall was experienced after the application of the second spray the conditions may be considered as a severe test of the value of the third application.

Trees adjacent to those included in the experiment received one application of cuprous oxide mixture (3-40) as part of the orchard routine. This spray was applied at the same time as the first spray in the experiment, i.e., at half to three-quarters petal fall. While no counts were taken, it was observed that there were nearly as many diseased fruit on these trees as on the unsprayed trees in the experiment. Rainfall figures show that December and January were wet months. The cover supplied by the first spray lasted for October and November but was not sufficient for December and January, the second spray being necessary to prevent infection in these two months.

Experiment 2 (1938-39).

In a trial set out at Woombye primarily for the investigation of the control of melanose some information was obtained with respect to the control of black spot. Orange trees of the Sabina variety were used.

The details of the spray schedules used are shown in Table V. In all schedules except E one application only was made, and this when

half to three-quarters of the petals had fallen. In treatment E a second application was made two months later, as in the usual black spot control programme.

At picking time the fruit was classified and counted as in the previous experiment. The results of these counts are shown in Table V.

TABLE V.

BLACK SPOT EXPERIMENT, 1938-39—PERCENTAGE OF MODERATELY AND SEVERELY DISEASED FRUIT.

Treatments.	Blocks.				Average.
	1.	2.	3.	4.	
A Cuprous oxide mixture (3-40)	2·1	5·3	2·7	3·1	3·3
B Cuprous oxide mixture (3-40 + Agral 2) ..	3·7	4·1	2·1	0·9	2·7
C Cuprous oxide mixture (3-80)	2·9	1·7	3·6	3·2	2·8
D Commercial cuprous oxide	4·8	2·0	2·0	1·3	2·5
E Two sprays cuprous oxide mixture (3-40)	2·1	1·2	1·6	0·8	1·4
F Bordeaux mixture (3-2-40)	1·6	0·4	3·1	2·5	1·9
G Controls	7·6	7·2	12·5	9·9	9·3

Necessary difference for significance = 2·2.

The above results suggest that—

(1) Both the home-made and commercially prepared cuprous oxide mixtures were as effective as Bordeaux mixture of the same copper content.

(2) The addition of a spreader, Agral 2, did not improve the efficiency of the cuprous oxide mixture in any way.

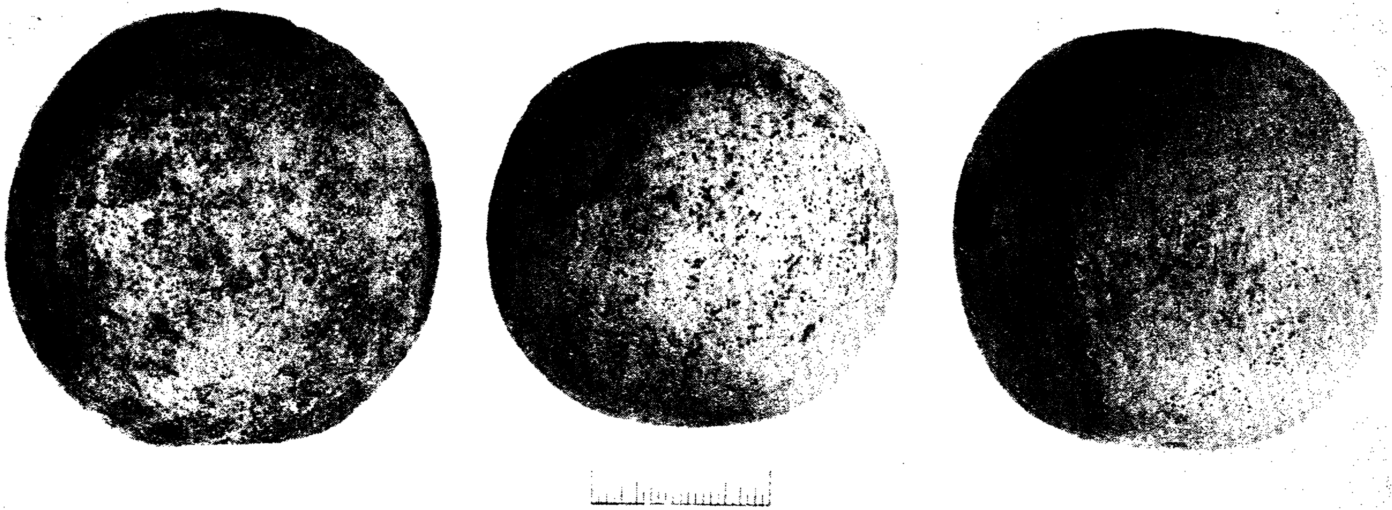
(3) The 3-80 strength cuprous oxide mixture was as effective as the 3-40 strength previously used.

(4) For this season the second application was not warranted. An examination of the figures for December and January shows that the rainfall was very low—104 and 392 points respectively—as a contrast with that in the Howard experiment, where the figures were much higher, with more days suitable for infection to take place.

MELANOSE.

Melanose and scab on tangelos are the two citrus diseases present in America, for the control of which cuprous oxide has been used. Kuntz (1938) used cuprous oxide (1-100) together with lethane and cotton-seed oil and found it slightly superior to 3-3-100 Bordeaux mixture for the control of melanose.

The only investigation of the use of cuprous oxide for the control of melanose in Queensland was carried out at Woombye in the 1938-39 season. This experiment has already been outlined on page 15 in the section dealing with black spot. The spray schedules are given in Table V. Agral 2, a proprietary spreader, was added to the mixture



B

C

Plate 2.

MELANOSE.—Degrees of Infection.

A. Typical severely infected fruit.
B. Greatest amount of infection permitted in moderately infected grade.
C. Greatest amount of infection permitted in slightly infected grade.

in treatment B at the rate of 3 oz. to 40 gallons, twice the amount recommended by the manufacturers for use with Bordeaux mixture. The proprietary line of cuprous oxide used in treatment D is sold mixed with a spreader and sticker in the form of a powder which mixes readily with water, giving a spray which spreads evenly and adheres very well. As the powder contains 50 per cent. copper as cuprous oxide it was used at the rate of 1½ lb. to 40 gallons, giving a suspension of the same copper concentration as cuprous oxide mixture 3-40.

At picking time the fruit was classified and counted in a manner similar to that used when dealing with black spot. Fruit standards similar to those used to determine the degree of infection of black spot are illustrated in Plate 2. For the purpose of analysis the counts were also treated in a manner similar to that used in the black spot experiments. The figures are shown in Table VI.

TABLE VI.

MELANOSE EXPERIMENT, 1938-39—PERCENTAGE OF MODERATELY AND SEVERELY DISEASED FRUIT.

Treatments.	Blocks. 1.	2.	3.	4.	Average.
Cuprous oxide mixture (3-40)	nil	2·1	2·5	6·5	2·8
Cuprous oxide mixture (3-40 + Agral 2) ..	4·9	2·2	4·8	1·9	3·5
Cuprous oxide mixture (3-80)	5·6	5·5	2·7	5·5	4·8
Commercial cuprous oxide	2·0	7·2	0·7	0·6	2·6
Two sprays cuprous oxide mixture (3-40) ..	0·3	0·3	0·5	3·9	1·3
Bordeaux mixture (3-2-40)	nil	7·8	1·7	nil	2·4
Controls	26·4	14·0	21·3	15·4	19·3

Necessary difference for significance = 5·1.

From these results it may be concluded that—

(1) Home-made cuprous oxide and the commercial form are as effective as Bordeaux mixture for the control of melanose.

(2) The addition of Agral 2 as a spreader does not increase the efficiency of the home-made mixture in any way.

(3) The second application gives no additional control of melanose. Apart from the lack of rainfall suitable for infection in December and January, Burger (1923) has shown that a fruit is immune to infection by the melanose fungus six to eight weeks after setting.

(4) The dilution of the cuprous oxide mixture to the 3-80 strength did not decrease its fungicidal value to a noticeable extent.

SCAB.

No investigations of the value of home-made cuprous oxide mixture for the control of scab have been conducted in Queensland. Kuntz (1938), as mentioned previously, found that 1-100 cuprous oxide plus lethane and cottonseed oil was effective for a similar disease on tangelos

in America. In Queensland the disease, though severe in its effect on lemons and mandarins, is of rather rare occurrence in well conducted orchards. In a few cases it has appeared and observations showed that it could be kept in check with one application of cuprous oxide mixture 3-40 at half to three-quarters petal fall.

CONCLUSION.

From the foregoing descriptions of experiments and observations carried out in various citrus districts, it is evident that home-made cuprous oxide of a strength 3-40 is equivalent to a Bordeaux mixture (3-2-40), i.e., of the same copper content, for the control of brown spot, black spot, melanose, and scab. The 3-80 strength of cuprous oxide, i.e., half the copper content of the standard Bordeaux mixture, although used in only one season, then provided an effective control for both black spot and melanose. In a previous experiment with brown spot it was found to be of some value, and further investigation of the use of this strength would be worth while.

Apart from its fungicidal value the cuprous oxide mixture possesses definite advantages as a citrus spray, and since its efficiency is now proved it can confidently be recommended as a substitute for Bordeaux mixture. The fungicidal schedules now suggested for the control of brown spot, black spot, melanose, and scab in Southern Queensland may be set out as shown in Table VII.

TABLE VII.

FUNGICIDAL SPRAY SCHEDULES FOR SOUTHERN QUEENSLAND.

Disease.	Late September. (½ to ¾ petal fall.)	Late November.	Late February.
Brown spot . .	Cuprous oxide mixture (3-40)	Cuprous oxide mixture (3-40)	Cuprous oxide mixture (3-40)
Black spot . .	Cuprous oxide mixture (3-40)	Cuprous oxide mixture (3-40)	. .
Melanose . .	Cuprous oxide mixture (3-40)	. .	. .
Scab	Cuprous oxide mixture (3-40)	. .	. .

The 3-40 strength (3 gallons of stock in 40 gallons of water) is recommended, as there is not sufficient experimental evidence in favour of the 3-80 dilution.

The date of application of the late September spray may vary from mid-September to early October, depending on the state of the blossom. The late November spray may be varied accordingly from mid-November to early December, similar remarks applying to the late February spray.

COMPATIBILITY OF FUNGICIDAL AND INSECTICIDAL TREATMENTS.

The spray schedules recommended above for Southern Queensland citrus orchards provide for one, two, or three fungicidal applications through the spring and summer months. The trees may be also infested with various pests, such as scale insects, maori mite (*Phyllocoptes oleivorus* Ashm.) and the larger horned citrus bug

(*Biprorulus bibax* Bred.). The presence of such pests necessitates control measures which may involve fumigation or spraying at one or more times during the season. The fitting-in of a fungicidal programme with an insecticidal programme presents many difficulties, as the question of compatibility of treatments must be considered. The possibility of combining sprays, thereby reducing labour costs and saving time, must also be borne in mind.

For the purpose of the discussion of the compatibility of fungicidal and insecticidal treatments, the citrus districts of Southern Queensland may be broadly classified into two divisions—

(1) Inland districts, such as Gayndah, where the general practice is to fumigate for the control of insect pests.

(2) Coastal districts, such as Burrum, where the general practice is to spray for the same purpose.

In addition, in both divisions lime sulphur or sulphur dust, zinc sulphate and nicotine sulphate sprays may find a place in the spray programme.

Where spraying is practised for the control of pests, recourse must be made to several applications of different mixtures during the season to obtain a reasonable degree of control. The question, then, of interaction between such sprays and the residue of copper sprays on the trees and *vice versa* is very important. The compatibility and possible combinations of the various sprays with cuprous oxide mixture will be discussed under the headings of the sprays concerned. The association of copper sprays and fumigation injury is well known, and this question will be discussed in a final section on fumigation.

SCALICIDES.

For the control of certain citrus scale insects in Queensland, Summerville (1934) recommends various mixtures, chief of which are—

(1) Soap-washing soda.

(2) Soap-washing soda-white oil.

(3) White oil.

(4) Resin-caustic soda-fish oil.

These sprays have been applied at various times in the experimental work prior to applications of cuprous oxide mixture without any adverse effects to the tree. Applications have also been made following a copper spray without signs of injury. As a further check on this an experiment, partly described under the section dealing with brown spot, was set out in the 1937-38 season in which the above scalicides were applied within a week of the application of Bordeaux and cuprous oxide mixtures. No aggravation of injury was observed. The soap-washing soda mixture caused a small amount of leaf fall, but no differences were noticed where the copper sprays had been applied. Following the applications of the soap-washing soda-white oil, white oil and resin-caustic soda-fish oil sprays, three very hot days were experienced. These caused severe sunburn to exposed areas of the fruit (Emperor mandarins). The copper sprays did not seem to intensify this injury.

From the spray schedules used in the experiments for the control of brown spot and black spot, it was evident that there are possibilities

of combining two copper sprays with the scalicide applications, e.g., the late November fungicide for the control of brown spot and black spot may be combined with the early December scalicide for pink wax scale (*Ceroplastes rubens* Maskell), and the late February fungicide for the control of brown spot may be combined with the March scalicide for the control of the complex scale infestation on Emperor mandarins at this time. On investigation, it was found that when soap was added to the cuprous oxide mixture a thick curdy precipitate was formed. The formation of this precipitate was traced to the presence of calcium salts in the molasses. If cuprous oxide mixture is added to the soap-washing soda-white oil combination this curdy precipitate is again formed and the oil emulsion is broken. The curd is carried to the surface by the free oil and forms a thick, greasy scum, which is a useless obstruction, while the free oil is dangerous. It is possible that some redissolved copper compounds may also play a part in this reaction.

Experiments carried out with pure chemicals showed that a precipitate of cuprous oxide could be obtained by using glucose instead of molasses. This mixture was compatible with the soap-washing soda-white oil spray. A source of reducing sugars low in ash content as a substitute for molasses was then sought. Honey was chosen, as the ash content is less than 0·1 per cent. Cuprous oxide mixtures made up with honey were mixed with soap-washing soda-white oil without any adverse reactions taking place.

As the fungicidal schedule for the control of brown spot offers the best opportunity for the use of these combination sprays, an experiment was set out in the Howard district in the 1938-39 season using the schedules given in Table VIII. In making up the cuprous oxide mixture for combination with the scalicides, 1 pint of honey was used to 3 lb. of bluestone. The possibility of the reduction of this amount of honey has already been discussed.

TABLE VIII.

BROWN SPOT EXPERIMENT, 1938-39—SPRAY SCHEDULES.

Time of Application.	Schedule A. (originally recommended).	Schedule B.	Schedule C. (no fungicides).
¼ to ¾ petal fall	Cuprous oxide mixture (molasses formula 3–40)	Cuprous oxide mixture (molasses formula 3–40)	. .
Mid November	Cuprous oxide mixture (molasses formula 3–40)	. .	. .
Late November	Soap—washing soda	Soap—washing soda + cuprous oxide mixture (honey formula 3–40)	Soap—washing soda
Late February	Cuprous oxide mixture (molasses formula 3–40)	. .	. .
Late March . .	Soap—washing soda —white oil	Soap—washing soda —white oil + cuprous oxide mixture (honey formula 3–40)	Soap—washing soda —white oil

The dates of application of the scalicides and the scalicide fungicide combination sprays were determined by the condition of the pink wax scale infestation. The final application of these sprays should have

been made in early March but was unduly delayed (approximately four weeks) because of inclement weather.

The scalicide sprays were made up according to formulae recommended by Summerville (1934), and in the combination sprays full strengths of both scalicides and fungicides were used.

Lime sulphur sprays were also applied according to the farmer's practice—(*a*) 1-10 strength just prior to blossoming, and (*b*) 1-40 in early January for the control of maori mite.

The fruit at picking time was classified and counted, the figures being shown in Table IX.

TABLE IX.

BROWN SPOT EXPERIMENT, 1938-39—PERCENTAGES OF DISEASED FRUIT PER PLOT.

Schedule.	Blocks.								Average.
	1.	2.	3.	4.	5.	6.	7.	8.	
A ..	6·0	6·9	7·3	11·0	6·3	7·9	2·4	3·4	6·4
B	14·5	7·3	9·0	8·7	8·0	6·0	6·9	1·6	6·4
C ..	20·8	32·6	21·4	16·5	21·2	27·7	8·6	7·2	19·5

Necessary difference for significance = 4·5.

A fortnight after the application of the scalicide and scalicide fungicide combination sprays, counts of live and dead scales were made to ascertain whether any loss of efficiency of the scalicides occurred when the fungicide was added.

In the case of the first scalicide application in November pink wax was the scale concerned. Samples of infested twigs were taken at random and live and dead scales counted, neglecting those scales which from the appearance of the leaf surface had not received a covering of spray. A 90 per cent. kill was obtained on the average for both the scalicide alone and in combination with the cuprous oxide mixture. No significant differences between the two treatments were revealed by statistical analysis.

A similar procedure was followed for the second application of scalicide and combination sprays. In this case samples of fruit were taken and the kill of red scale estimated in a manner similar to that used for pink wax. Again analysis revealed no significant differences between the two treatments.

From these figures it is obvious that no reduction in scalicidal or fungicidal properties occurred when the two sprays were mixed for the second and third fungicidal applications. Incidentally the three-spray schedule for brown spot control was once more proved of value.

Although actual trials have not been carried out, it is considered unlikely that loss of efficiency would occur where resin-caustic soda-fish oil or white oil sprays are used as the scalicides in the combination sprays.

In respect of these combination sprays cuprous oxide mixture shows to advantage when compared with Bordeaux mixture. The presence of lime in the latter makes the use of soap as a spreader undesirable. The combination of Bordeaux mixture with scalicides made up partly with

soap is not to be recommended, as the insoluble calcium soaps form a very thick curd, making spraying difficult and dangerous if free oil should be liberated in the process. It has also been found (Porter and Sazama, 1930) that though Bordeaux mixture may be safely combined with white oil sprays, the efficiency of the latter is reduced.

LIME SULPHUR.

Applications of this spray are usually made in winter for the control of white louse (*Chionaspis citri* Comstock), and in summer for the control of maori mite. Cuprous oxide mixture should not be added to this spray, as a black precipitate of copper sulphide mixed with sulphur is formed. While no harm to the tree would result from the use of such a mixture, the strength of the lime sulphur would be considerably if not completely reduced.

The winter application of 1-12 to 1-15 strength is made after the harvest of the crop and just prior to blossoming. The spray should be confined to the trunk and main limbs of the tree, as white louse is rarely found on the twigs. Of course, it is unavoidable that some of the spray reaches the leaves, and some growers make it a practice to spray the whole tree. The first application of the cuprous oxide mixture is often made shortly afterwards, though the period between the two sprays is usually three weeks or longer. When lime sulphur is applied to trees decomposition of the calcium polysulphides takes place to form calcium carbonate and sulphur. This reaction is probably complete in three weeks under the usual orchard conditions, so that when the copper spray is applied no interaction is likely to occur. In all the experiments conducted at Howard for the control of brown spot of the Emperor mandarin this type of spray schedule was used, and no ill-effects to the tree were noted. No black deposit of copper sulphide was formed and the control of disease was quite satisfactory.

The summer application of lime sulphur of 1-35 strength or weaker for the control of maori mite is usually made in December or January, so that it follows shortly after the second application of copper spray for the control of brown spot and black spot and precedes the third application for brown spot. Where the lime sulphur application follows closely on a copper spray a black deposit of the copper sulphide is formed. Hely (1938) reports that under certain conditions of temperature and tree growth injury may follow the use of lime sulphur after Bordeaux mixture, but no case of injury has been found under Queensland conditions where cuprous oxide has been used. In the Howard and Woombye experiments this order of application formed part of the spray schedules without detriment to the trees, and the control of the diseases and pests seemed quite satisfactory, although the rate of weathering of the copper spray residue is much accelerated. It would probably be best to allow at least a fortnight to elapse between applications of these sprays.

SULPHUR.

Sulphur dust is often used by growers for the control of maori mite. This dust may precede or follow closely applications of cuprous oxide mixture quite safely, as no reaction occurs between the two.

NICOTINE SULPHATE.

Though rarely found in a citrus spray schedule, nicotine sulphate may sometimes be used for the control of outbreaks of aphis which attack the young growth. Where the application of this spray coincides with that of the cuprous oxide mixture, the two may be mixed. As, however, it is usual to add soap to liberate the nicotine, it would be preferable to use the honey formula discussed previously in connection with scalicides.

LEAD ARSENATE.

At some future date it may be found necessary to employ a lead arsenate spray for the control of certain insect pests of citrus such as the fruit-eating, long-horned grasshoppers (Tettigoniidae) and the leaf-eating weevil (*Eutinophoea bicristata* Lea.). As the application of lead arsenate may have to be made at approximately the same time as an application of cuprous oxide mixture, the two could be mixed, but special care should be taken to see that there is no excess caustic soda in the copper spray, as this would result in arsenic going into solution, thus causing severe burning. This combination has been used on citrus without any ill-effects. The weathering of the copper residue is also not affected in any way. (Table X.)

ZINC SULPHATE-HYDRATED LIME.

A zinc sulphate-hydrated lime mixture at a strength of 4-2-40 applied in the spring is used as a check for foliocellosis or mottle leaf. This spray may be combined with cuprous oxide mixture quite safely.

Where fumigation is used for the control of insect pests, this combination should be used with caution. As will be discussed later, the rate of weathering of a copper spray has an important bearing on fumigation procedure. Accordingly, two experiments were set out to investigate the effect of zinc sulphate on the weathering of the cuprous oxide mixture. The first experiment was set out at Woombye, the spray mixtures investigated being those shown in Table X.

Samples were taken immediately the spray had dried and again when 6½ inches of rain had fallen. The analyses showing the copper residue on the leaves are given in Table X. The figure represents the average of samples taken from seven trees in each treatment.

TABLE X.

WEATHERING OF COMBINATION SPRAYS (WOOMBYE), 1939-40.

Mixture.	Original deposit per 200 sq. cms.	Residue per 200 sq. cms. after 6½ in. of rain.
	Mgms of Cu.	Mgms of Cu.
Cuprous oxide mixture	1·12	0·54
Cuprous oxide mixture + lead arsenate ..	1·14	0·53
Cuprous oxide mixture + zinc sulphate—lime ..	1·21	0·62
Cuprous oxide mixture + zinc sulpnate—lime + lead arsenate	1·14	0·64

A similar experiment was set out in the Gayndah district using the spray mixtures shown in Table XI. As in the previous experiment,

samples were taken immediately the spray had dried and again after 535 points of rain had fallen. These analyses, the average of samples from eight trees in each treatment, are shown in Table XI.

TABLE XI.

WEATHERING OF COMBINATION SPRAYS (GAYNDAH), 1939-40.

Mixture.	Original deposit per 200 sq. cms.	Residue per 200 sq. cms. after 5·35 in. of rain.
	Mgms of Cu.	Mgms of Cu.
Cuprous oxide mixture	1·29	0·82
Cuprous oxide mixture + zinc sulphate—lime ..	1·29	0·77
Cuprous oxide mixture + zinc sulphate—caustic soda	1·39	0·78

Although the above analyses show that the zinc sulphate-lime mixture has little effect on the rate of weathering of the copper, the presence of the lime, by making the spray alkaline, may introduce complications with subsequent fumigation as discussed by Butler and Jenkins (1930). The use of caustic soda as a substitute for the hydrated lime in the zinc spray is being investigated and so far seems to be successful. The rate of weathering of the copper spray is not changed in any way by this substitution, and as a mixture can be obtained very close to neutrality by the use of 4¾ oz. of caustic soda per 1 lb. of zinc sulphate, the possible adverse effects of hydrated lime are eliminated. Lead arsenate may also be added to this combination quite safely, providing care is taken to avoid excess caustic soda in the mixture. The weathering of copper is also little affected by this combination.

FUMIGATION.

In districts where fumigation with hydrocyanic acid gas has been the practice for pest control, the use of copper fungicides has been little employed. When Bordeaux mixture has been applied to trees there is a possibility of severe injury following subsequent fumigation. Summerville (1934) advises that at least six months should elapse before fumigating after an application of copper spray, and even after that length of time there is still a risk of serious injury. As, in most cases, fumigation, to be at the effective time, must be used four months and sometimes two months after an application of a fungicide, it can be understood why Bordeaux mixture has not been used.

At various times during the experimental work reported here, an orchardist has fumigated trees, which a short time previously had been sprayed with cuprous oxide mixture, without any appearance of injury. This prompted an investigation of fumigation following copper sprays. In all, three experiments were carried out in the Gayndah district using large, very vigorous Washington Navel trees.

Experiment 1 (1937-38).

Forty trees were included in the experiment. These were divided into groups of four, each tree receiving one of the following treatments:—

A. One application of cuprous oxide mixture (3-40) at half to three-quarters petal fall (21st and 22nd September) and a second two months later (19th November).

B. One application of cuprous oxide mixture (3-40) in late September.

C. One application of Bordeaux mixture (3-2-40) in late September.

D. Controls—no spray.

Two blocks of four trees were then fumigated as follows:—

(1) Late November (25th November)—full dosage.

(2) Mid-December (18th December)—(*a*) full dosage.
(*b*) half dosage.

(3) Early February (4th February)—(*a*) full dosage.
(*b*) half dosage.

At the time of each fumigation, the temperatures as registered by a wet and dry bulb thermometer hung on a shady tree near the site of the fumigation were recorded. It was subsequently found that these readings were two or three degrees higher than the registrations in the standard screen. The relative humidity was obtained from these two temperatures, the figures for each fumigation being shown in Table XII.

TABLE XII.

TEMPERATURES AND RELATIVE HUMIDITIES, 1937–38—FUMIGATION EXPERIMENT.

——	1st Fumigation.		2nd Fumigation.	3rd Fumigation.
	Block 1.	Block 2		
Dry bulb	79° F.	73° F.	93° F.	90° F.
Relative humidity . .	47%	54%	35%	60%
Notes	Overcast with tendency to rain		Hot and clear	Hot and clear

A short period after fumigation, varying from ten days to a month, the trees were examined for any injury, the nature of which was as summarised below.

First Fumigation.

The percentage leaf fall in the two blocks was as follows:—

A. Two applications of cuprous oxide mixture—block 1, 70; block 2, 5-10.

B. One application of cuprous oxide mixture—block 1, 3-5; block 2, 5.

C. One application of Bordeaux mixture—block 1, 60-70; block 2, 5.

D. No spray—block 1, 1-2; block 2, nil.

Practically all the leaf fall on the trees in block 2 was on the south side where the sheets were wet by a shower of rain.

Second Fumigation.

No injury to any of the trees was noted. There was no leaf fall and even the young watershoot growth had not been burned in any way.

Third Fumigation.

A very small amount of injury of the order of 1·2 per cent. resulted from this fumigation. In all cases it could not be considered of commercial significance. Little difference could be detected between injury due to full dosage and that due to half dosage of the fumigant. The order of the degree of leaf fall with respect to the four fungicidal treatments was as follows:—

Block 1.

Full dosage—C $>$ A $>$ B $>$ D.
Half dosage—C $>$ A $=$ B $=$ D.

Block 2.

Full dosage—C $=$ A $=$ B $>$ D.
Half dosage—C $>$ A $=$ B $>$ D.

Experiments 2 and 3. (1938-40.)

In the 1938-39 season an attempt was made, using the same trees as in the experiment just described, to investigate the possibility of fumigation injury in the two months immediately following the spray application. Full dosage fumigations were made at intervals of 3 and 5 weeks after spraying but no injury resulted. As these fumigations were carried out in a very dry period (95 deg. F. and 30 per cent. relative humidity approximately at the time of fumigation) three more fumigations were tried later at intervals of 12, 13 and 20 weeks after the application of spray. A considerable amount of wet weather had intervened in the meantime, but again no injury to the trees sprayed with either Bordeaux or cuprous oxide mixtures resulted, though relative humidities of 60 per cent. to 80 per cent. with a temperature of 84 deg. F. were experienced.

In 1939-40 a third experiment was carried out by spacing the spray applications at intervals of 7, 8, 12, and 14 weeks prior to the fumigation. In no case was there any serious injury on either the Bordeaux sprayed trees or those receiving cuprous oxide. The average temperature and relative humidity at this fumigation were 90 deg. F. and 56 per cent. respectively. A week later another block similarly sprayed was fumigated at temperatures ranging from 96 deg. F. (45 per cent relative humidity) to 105 deg. F. (37 per cent. relative humidity) without any sign of injury.

Discussion.

From the variable results obtained from these experiments it is evident that copper spray-fumigation injury is bound up with such a very complicated set of environmental conditions that it is difficult to evaluate the importance of each individual factor. In only one case in the experiments just described did fumigation cause serious injury, viz., the first fumigation in the 1937-38 experiment. Apart from the fact that the temperature and relative humidity conditions vary slightly from some of those in fumigations carried out subsequently, the main difference between this and other fumigations is a shower of rain which fell shortly after the removal of the sheets. While this was not sufficient to be registered in the gauge it was enough to wet the leaves of the trees in the first block fumigated and also the sheets which were then covering the trees in the second block. With

a slight breeze the sheets were wet on one side only and it was on this side that most injury was found in the second block of trees. This is in accordance with results obtained by Quayle (1928) who found that even unsprayed citrus trees fumigated with calcium cyanide were severely injured if wet with a shower of rain shortly after fumigation. Butler and Jenkins (1930) have also shown that the foliage of trees sprayed with Bordeaux mixture and then fumigated was severely injured if wetted shortly afterwards.

Two of the trees in the first block suffered very severe injury, being almost completely defoliated. One had received an application of Bordeaux mixture two months previously while the other had been sprayed with cuprous oxide mixture only one week before being fumigated. The trees sprayed with cuprous oxide mixture two months prior to fumigation showed very little more injury than the unsprayed trees. These results suggest that trees sprayed with cuprous oxide mixture may be fumigated with safety sooner than trees sprayed with Bordeaux mixture.

Although the fumigations were carried out over a wide range of temperatures and relative humidities, these were mostly within the safety limits suggested by the manufacturers, so that the effect of these two factors on the degree of injury was not closely investigated.

That severe injury was caused by fumigation shortly after an application of cuprous oxide mixture and none when the spray had been applied two months previously suggested that weathering of the spray residue from the leaves might be the factor causing the reduction in susceptibility to injury. Accordingly in the 1938-39 season, leaf samples were taken at intervals from the trees in the experiment and the spray residue estimated by analysis. Another series of analyses was also made from samples taken from the melanose control experiment in 1938-39. Plate 3 is a graph showing the rate of weathering of the various sprays in the Woombye experiment. The figures from the Gayndah experiment were more variable owing to the dense foliage of the trees making a spray cover difficult to obtain. However, trends similar to those shown in the Woombye graph were noted here.

From this graph it appears that rainfall is the important factor in the weathering of the spray residue, and secondly, that the rate of weathering of Bordeaux mixture is much slower than that of the cuprous oxide mixture. If a limiting figure is postulated for the copper content of the spray residue, above which injury is likely to occur following fumigation, trees sprayed with cuprous oxide mixture would need far less rain to render them safe for fumigation than trees sprayed with Bordeaux mixture of the same copper content. From the experimental results, fumigation when 9 inches of rain had fallen after spraying was safe, though 1 inch was not sufficient. From the very steep part of the graph showing speedy weathering shortly after spray application, it seems possible that 4 to 6 inches of rain would be the minimum requirement. Further confirmation of this hypothesis is needed.

The above discussion does not take into account the chemical composition of the spray. Guba (1926) has suggested that the injury which follows fumigation of plants sprayed with copper fungicides is due to the divalent form of copper combining with the hydrocyanic acid gas. The compounds formed by monovalent (cuprous) copper had

no harmful effects. If this is the case injury should not be expected to occur when fumigation is applied to trees recently sprayed with cuprous oxide mixture. That such injury did occur may possibly have been due to the presence of soluble copper compounds in the spray mixture, Guba and Holland (1933) having correlated the degree of injury following fumigation with the amount of soluble copper in the spray residue.

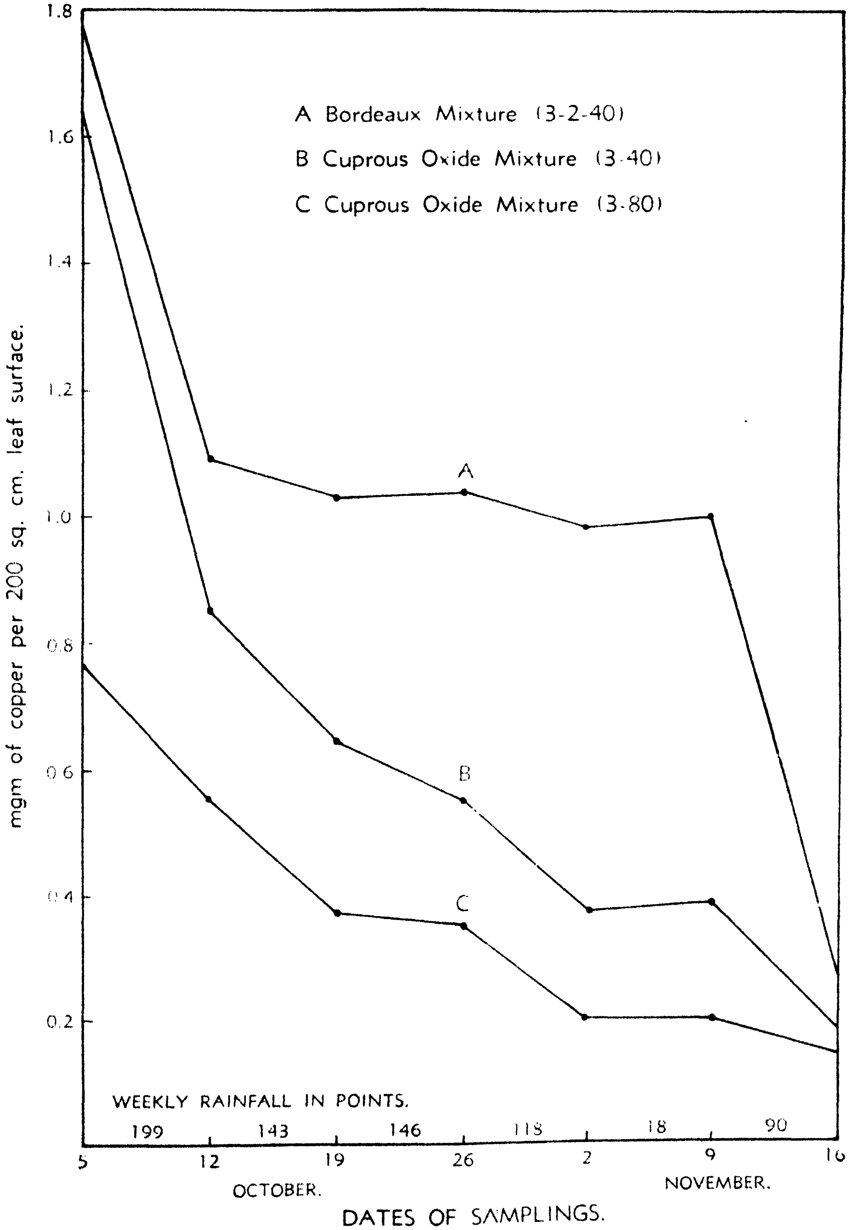


Plate 3.

RATE OF WEATHERING OF SPRAY RESIDUES, WOOMBYE, 1938-39.

From this discussion it seems probable that the reduction of the soluble copper in the spray mixture together with a reduction in the concentration of the spray used may have a profound effect on fumigation procedure after the application of copper sprays. For this reason the rate of weathering of the 3-80 strength cuprous oxide mixture shown in Plate 3 is of interest. On this evidence it is possible that fumigation may proceed with safety when as little as 2 inches of rain have fallen following the application of this spray. The quick drop in the copper content of the spray residue, due probably to the removal of the excess material applied, is sufficient to bring it below the margin above which injury would occur on fumigation.

The addition of Agral 2 as a spreader would not seem to affect this procedure in any way as the rate of weathering has been found to be unaffected. It is interesting to note here that the steep drop in the graphs for all the sprays, especially Bordeaux mixture, during the week November 9-November 16, occurred during the rainy period following an application of lime sulphur made on November 8.

SPRAY SCHEDULES FOR SOUTHERN QUEENSLAND.

From the foregoing discussion of interactions and combinations of treatments, spray schedules for the control of the diseases and pests in a citrus orchard may be formulated. As a guide for growers, basic schedules for the two types of citrus districts in Southern Queensland are given below. It is to be understood that these schedules are not necessarily the treatments an orchardist would use, but that they represent the skeleton on which, by reference to the various departmental publications concerning the pests and diseases found in his orchard, he may build his spray programme. No mention is made of the lime sulphur sprays for the summer control of maori mite. These can best be fitted in as required with due regard to the precautions discussed earlier under the heading of lime sulphur sprays. Their inclusion here would somewhat unnecessarily complicate the outlined programme.

On the coast the most important entomological troubles with which an orchardist must contend are an infestation of one or several species of scale insects. A spray programme for these districts is shown in Table XIII.

TABLE XIII.

BASIC PEST AND DISEASE CONTROL PROGRAMME FOR COASTAL DISTRICTS.

Spray.	Time of Application.	Pests and Diseases.
Lime sulphur 1–12 to 1–15 ..	Pre-blossom	Maori mite, white louse
Cuprous oxide mixture 3–40 + zinc sulphate—lime ..	¾ to ⅞ petal fall	Brown spot, black spot, melanose and scab together with foliocellosis
Cuprous oxide mixture (honey formula) 3–40 + scalicide	Late November to early December	Brown spot, black spot, and scale insects
Cuprous oxide mixture (honey formula) 3–40 + scalicide	Late February to early March	Brown spot and scale insects

The above spray programme is suitable for Emperor of Canton mandarins. For other early varieties such as Joppa oranges, the cuprous oxide mixture is omitted from the last combination spray. For the later varieties such as Late Valencias, the last combination spray is replaced by an application of scalicide in late March to April.

In the inland districts, as well as scale insects, the orchardist must contend with the larger horned citrus bug. At least one and sometimes two or more fumigations are recommended for the control of this insect, the number depending on the infestation and migration.

A programme incorporating two fumigations for this pest is shown in Table XIV.

TABLE XIV.

BASIC PEST AND DISEASE CONTROL PROGRAMME FOR INLAND DISTRICTS.

Treatment.	Time of Application.	Pests and Diseases.
Lime sulphur 1–12 to 1–15 ..	Pre-blossom	Maori mite, white louse
Cuprous oxide mixture 3–40 or 3–80 + zinc sulphate —caustic soda	½ to ¾ petal fall	Scab, melanose, and black spot, together with foliocellosis
Fumigation	November	Larger horned citrus bug
Cuprous oxide mixture 3–40 or 3–80	1 week after fumigation..	Black spot
Fumigation	Late January	Larger horned citrus bug and scale insects

By adhering to the above programme, in average seasons, sufficient rain will have fallen following spraying to render fumigation safe. It is important to note that the November fumigation precedes the second application of copper spray, the reverse order involving serious risk of injury.

The above schedule may be applied to lemons. For early varieties of citrus other than lemons, such as Washington Navels and grapefruit, the first fumigation is omitted. For late varieties, such as Late Valencia oranges and Glen Retreat mandarins, the first fumigation is also omitted, and if there is no infestation of the larger horned citrus bug, the second may be delayed until March, thereby rendering fumigation of these varieties safer.

SUMMARY.

1. A study has been made of the value of a cuprous oxide mixture, prepared from copper sulphate, molasses, and caustic soda, in citrus spray schedules in Southern Queensland.

2. The chemical composition of the spray is discussed and suggestions made for an alternative formula, using honey as a source of reducing sugars.

3. By means of field experiments, the phytocidal and fungicidal effects of the mixture have been tested in comparison with Bordeaux mixture of the same copper content.

Cuprous oxide mixture did not seem to injure the trees in the manner commonly associated with the use of Bordeaux mixture.

No differences could be found between the fungicidal efficiencies of the two mixtures for the control of brown spot, black spot, and melanose. Observations showed that scab may be controlled as well.

4. The compatibility of cuprous oxide mixture with various other citrus sprays is discussed. By modifying the original formula, the mixture may be added to sprays containing soaps and/or white oil. The efficiency of both components of these mixtures is not impaired in any way.

5. Trees sprayed with cuprous oxide mixture may be fumigated sooner after spraying than when Bordeaux mixture is used. It is suggested that this may be due to the fact that cuprous oxide mixture is removed from the leaves by rain more readily than Bordeaux mixture.

6. On the basis of these experiments comprehensive spray schedules are formulated for the control of citrus diseases and pests in Southern Queensland.

ACKNOWLEDGMENTS.

Sincere thanks are tendered to Messrs. C. E. Farmer, Howard, F. C. Robinson, Gayndah, and T. Gooding, Woombye, who kindly made blocks of trees available for experimental purposes, and without whose help and co-operation the work would not have been possible.

BIBLIOGRAPHY.

ANDERSON, H. W., K. J. KADOW, and S. L. HOPPERSTEAD. (1937).—The evaluation of some cuprous oxides recommended as seed treatment products for the control of damping-off. Phytopath, XXVII., 575-587.

BARTH, —, ex. BOURCART, E. (1925).—Insecticides, fungicides, and weed killers. 2nd rev. ed., London: Scott, Greenwood, and Son.

BURGER, O. F., ex. FAWCETT, H. S. (1936).—Citrus diseases and their control. 2nd ed., New York and London: McGraw-Hill Book Co., Inc.

BUTLER, O., and R. J. JENKINS. (1930).—Effect on plants of cyanide fumigation following spraying with Bordeaux mixture. Phytopath., XX., 419-429.

DORAN, W. L. (1923).—Toxicity studies with some copper fungicides. Phytopath., XIII., 532-542.

FAWCETT, H. S. (1936).—Citrus diseases and their control. 2nd ed., New York and London: McGraw-Hill Book Co., Inc.

GUBA, E. F. (1926).—Injury to glasshouse plants from hydrocyanic acid gas, following the application of copper fungicides. Phytopath., XVI., 633-634.

GUBA, E. F., and E. B. HOLLAND. (1933).—Effect of hydrocyanic gas on cucumber plants previously sprayed with copper fungicides. Massachusetts Agric. Exp. Sta. Bull. 303 (in R.A.M. XIII., 418, 1934).

HELY, P. C. (1938).—The interaction of sprays commonly used on citrus trees in coastal districts. Agric. Gaz. New South Wales, XLIX., 545-548.

HEUBERGER, J. W., and J. G. HORSFALL. (1939).—Relation of particle size and colour to fungicidal and protective value of cuprous oxides. Phytopath., XXIX., 303-321.

HOAR, T. P. (1937).—The colorimetric determination of copper with sodium diethyldithiocarbonate in the presence of moderate amounts of iron. Analyst, LXII., 657-663.

HOLLAND, E. B., C. O. DUNBAR, and G. M. GILLIGAN. (1929).—Supplements for copper fungicides. Massachusetts Agric. Exp. Sta. Bull. 252, 94-112.

HORSFALL, J. G. (1932).—Red oxide of copper as a dust fungicide for combating damping-off by seed treatment. New York State Agric. Exp. Sta. Bull. 615.

HORSFALL, J. G., G. E. R. HERVEY, and R. F. SUIT. (1939).—The dwarfing of cucurbits sprayed with Bordeaux mixture. Jour. Agric. Res., LVIII., 911-927.

HORSFALL, J. G., G. JAMES, and R. F. SUIT. (1938).—Spraying greenhouse seedlings with red copper oxide. New York State Agric. Exp. Sta. Farm. Res. 4 (2), 9.

HORSFALL, J. G., R. O. MAGIE, and R. F. SUIT. (1938).—Bordeaux injury to tomatoes and its effect on ripening. New York Agric. Exp. Sta. Tech. Bull. 251.

HORSFALL, J. G., R. W. MARSH, and H. MARTIN. (1937).—Studies upon the copper fungicides. IV. The fungicidal value of the copper oxides. Ann. App. Biol., XXIV., 867-882.

KUNTZ, W. A. (1938).—Florida Ag. Exp. Sta. Ann. Rept. 1937-38, 139 and 145.

MCCALLAN, S. E. A., and F. WILCOXIN. (1938).—Laboratory comparisons of copper fungicides. Contrib. Boyce Thompson Inst., IX., 249-263.

MCCLEERY, F. C. (1939).—Black spot of citrus. Agric. Gaz. New South Wales, L., 618-622.

MANDELSON, L. F. (1933).—Black spot control experiments. Unpublished manuscript.

MANDELSON, L. F. (1933).—Additional recommendations for the control of blue mould of tobacco. Queensland Agric. Jour., XL., 465-469.

MANDELSON, L. F., and F. W. BLACKFORD. (1938).—Brown spot of the Emperor of Canton mandarin and its control. Queensland Agric. Jour., L., 132-143.

MARSH, R. W., H. MARTIN, and R. G. MUNSON (1937).—Studies upon the copper fungicides. III. The distribution of fungicidal properties among certain copper compounds. Ann. App. Biol., XXIV., 853-866.

PERRET, M., ex E. PRILLIEUX. (1895).—Maladies des plantes agricoles. Paris. Firmin Didot et Cie.

PORTER, B. A., and R. F. SAZAMA. (1930).—Influence of Bordeaux mixture on the efficiency of lubricating oil emulsions in the control of San Jose scale. Jour. Agric. Res., XL., 755-766.

QUAYLE, H. J. (1928).—Fumigation with calcium cyanide dust. Hilgardia, III., 207-232.

RALEIGH, W. P. (1933).—Home-made colloidal copper spray. Phytopath. XXIII., 29 (abs.).

RHOADS, A. S. (1929).—The cause of melanose and its control. Florida Agric. Exp. Sta. Press Bull. 421.

SUMMERVILLE, W. A. T. (1931).—The larger horned citrus bug. Queensland Dept. Agric. and Stock, Bull. 8 (n.s.).

SUMMERVILLE, W. A. T. (1934).—Queensland citrus scale insects and their control. Queensland Dept. Agric. and Stock, Bull. 10 (n.s.).

WINSTON, J. R., J. J. BOWMAN, and W. J. BACH. (1927).—Citrus melanose and its control. U.S.D.A. Bull. 1474.

The Buffalo Fly (*Lyperosia exigua* de Meijere).

F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

THE buffalo fly affords an excellent example of an insect which, whilst comparatively unimportant in its native country, has, upon introduction into a new land, become a pest of serious dimensions. In the East Indies it is not generally regarded as a harmful parasite of stock, but in Australia it has become a stock pest of outstanding importance.

The fly receives its common name "buffalo fly" from its association with the buffalo. Closely allied species occur in America (*Lyperosia irritans*) and in South Africa (*Lyperosia minuta*), where they are known as horn flies from their habit of resting on the horns of cattle.

Distribution in Australia.

The buffalo fly occurs in India, Northern China, East Indies, and New Guinea, as well as in Australia. Its introduction into Australia is thought to have occurred about 1825, when a number of buffaloes were brought into the Northern Territory by way of Melville Island. For many years the fly remained confined to the country in and around Darwin, and it was not till 1912 that attention was drawn to it as a major pest of cattle. During the next fifteen years the fly spread rapidly as a result of extensive cattle movements, and by 1927 its area of distribution extended from Broome, in Western Australia, almost to the Queensland border on the east and to the watershed of the coastal rivers on the south. It crossed into Queensland over the far northwestern border in 1928. During subsequent years the distribution of the fly in Queensland fluctuated a good deal, depending upon the rainfall, but it never extended further east than Inverleigh, which is between Burketown and Normanton. It would seem that the fly's progress towards the east had been held up in this area by a stretch of comparatively dry plains country, which was apparently unfavourable to the fly. In 1939, however, the fly managed to cross this area, and almost reached Normanton. This year experienced an excellent season, as did also 1940 and 1941, and at the present time the fly's distribution within the State extends along the coast of the Gulf of Carpentaria from the Northern Territory border to the Mitchell River, thence inland for distances of 100 to 300 miles.

Description.

The buffalo fly (Plate 4, fig. 1) is a small, dark-grey, biting fly, about one-sixth of an inch in length—that is, about half the size of the ordinary house fly. If examined under a lens, two well-defined dark stripes will be seen on its back or thorax, and a single central dark stripe on the brownish abdomen. The legs are usually yellowish. Projecting from the underside of the head is an erect, tubular structure called the proboscis (Plate 4, fig. 2). This contains the various structures composing the mouth parts of the fly, by means of which the fly is able to pierce the skin and suck up blood. In non-biting flies, such as the house fly, the proboscis is soft and can be withdrawn into the head, and the mouthparts are constructed for sucking only.

Habits.

Both male and female buffalo fly live on blood. Primarily a parasite of the buffalo, the fly will also attack cattle, horses, mules, donkeys,

and man. Reports indicate that sheep, when in contact with cattle, may be attacked as well.

In Australia, the fly is found chiefly on cattle. It shows a distinct preference for bulls, then stags, aged cows, bullocks, and cows. Animals in poor condition are usually heavily attacked, whilst only very few flies are to be found on calves. Man is attacked usually only when he is working infested cattle.

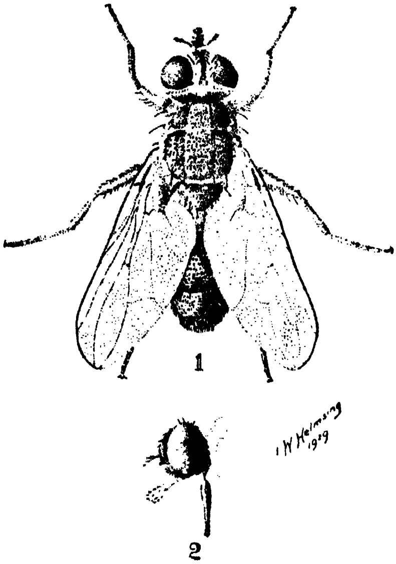


Plate 4.

THE BUFFALO FLY.—(1) Adult fly x 8. (2) Lateral view of head of fly showing erect proboscis.

Unlike other blood-sucking flies, such as mosquitoes, march flies, and sandflies, which visit cattle only when food is required, buffalo flies remain on the animals throughout the whole of their adult life, leaving the animals only when disturbed or for the purpose of laying eggs. Under normal conditions, the flies occur chiefly on the withers, neck, dewlap, sides of chest, shoulders, eyes, loins, and shank (Plates 5 and 6). At night the pests scatter over the body, but chiefly along the back. On cold mornings they are to be found for the most part on the shoulder, belly, and neck, rarely on the wither, and in hairy animals they burrow well into the hair. Occasionally, and chiefly in bulls, the flies may be seen resting in numbers on the bases of the horns. In the case of the eyes, these are infested more particularly if they have been previously attacked by bush flies.

The wings are normally held at an angle to the body, though under cool conditions when the flies become very sluggish, there is a tendency to close the wings, scissor fashion, over the abdomen.

When feeding, the flies work down among the hairs, and close to the skin. The body lies parallel to the hairs, and the wings are held horizontal to the body. The number of times per day that flies feed is unknown. When disturbed the flight of the buffalo fly is very characteristic. They leave the animal in swarms, which have a short, quick vertical flight, to return and settle almost immediately. They do not appear to hover or dart about, and do not crawl about over the body.

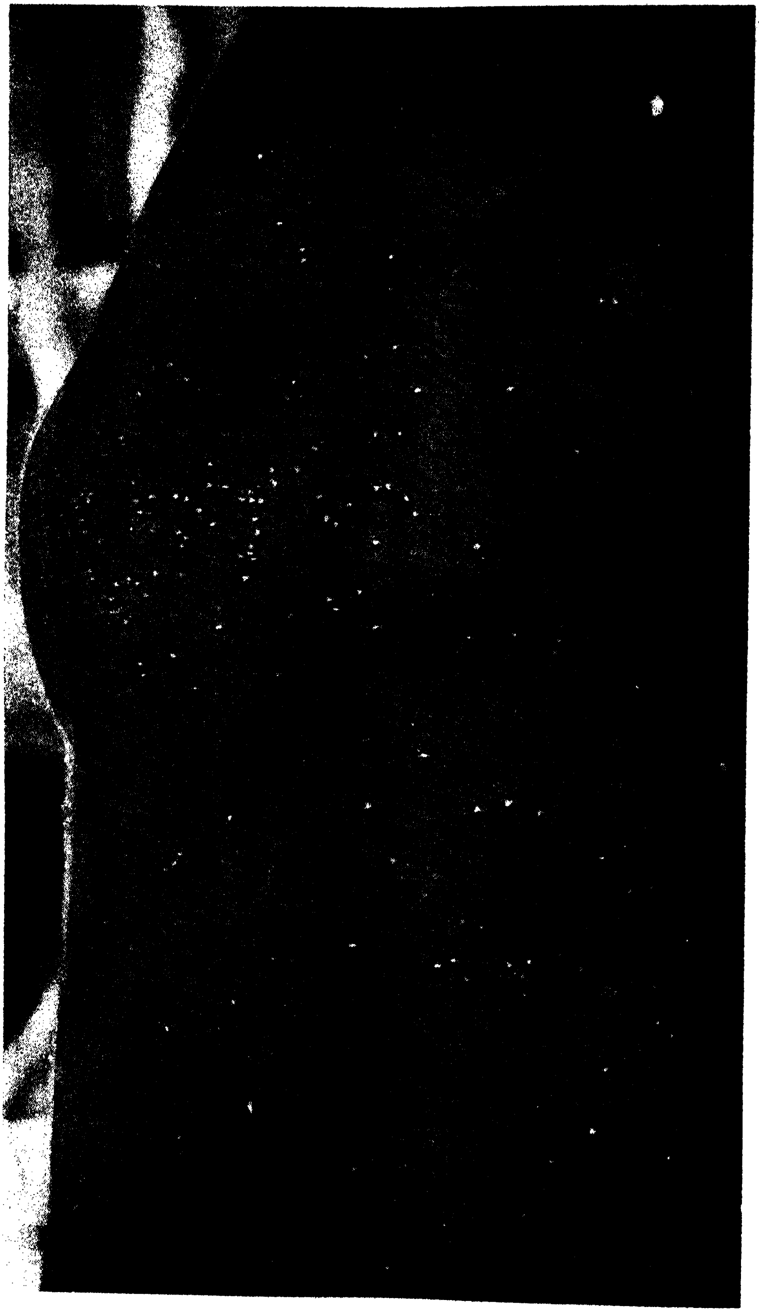


Plate 5.

HEAVY INFESTATION OF BUFFALO FLIES ON AND BEHIND THE WITHER OF A BULL.

Plate 6.

HEAVY INFESTATION OF BUFFALO FLIES ON SHOULDER, WITHER, AND BACK OF A COW.—The large sores on and behind the shoulder, and on the neck, are typical buffalo fly markings. This photo. also shows how iridescent the wings of the fly are when in the sun.

Buffalo flies dislike dust, and infested cattle being worked under dusty conditions quickly lose their infestations. When being driven, it frequently happens that the animals in the lead are very much more heavily infested than those in the tail, a phenomenon considered to be also associated with dust.

Rain, even heavy rain, apparently has little effect on the flies, for under such conditions they move to the more sheltered parts of the body.

The Life History.

The life cycle of the buffalo fly consists of four separate stages—namely, the egg, larva, puparium, and adult.

The Egg.

The egg measures about one-twenty-fifth of an inch in length, and is somewhat sausage-shaped and creamy in colour. It is deposited by the female fly in the freshly-dropped dung of cattle and buffaloes. Under natural conditions, only bovine dung is suitable for the complete development of the larva. As soon as the fresh dung is dropped, the females fly down and deposit their eggs in sheltered crevices. Under normal summer conditions the eggs hatch in eighteen to twenty-four hours. If the eggs are laid in places that dry out quickly or are exposed to sunlight they will fail to hatch.

The Larva.

The larva is a typical fly maggot, being creamy white in colour and tapering towards the head end. A fully-grown buffalo fly larva measures about half an inch. On hatching from the egg, the larva immediately burrows into the dung and keeps on burrowing as the surface layers dry out. The amount of moisture present in the dung is a very important factor in the development of the larva. The optimum moisture content is about 68 per cent. When the amount of water is much below or in excess of this figure, development is seriously affected and may cease. Under normal summer conditions, the larva completes its growth in three to five days.

The Puparium.

When fully grown, the larva makes its way into the bottom layers of the dung or into the soil. Then it shrinks to about half its size, and its skin hardens and turns brown. Inside this barrel-shaped puparium, as it is called, the adult fly gradually takes form. Inside three to five days the development of the adult is complete and, pushing off one end of the puparium, the fly makes its way into the sunlight, dries its body and wings, and flies off on its search for a host.

Duration of Life Cycle.

Thus, under normal summer conditions, the life cycle occupies seven to eleven days. Should cool conditions prevail, however, each stage in

the life cycle takes longer to complete its development, and so, during winter, the life cycle may take as long as forty-six days or more.

Length of Life of Adult Fly.

Very little is known as to how long flies will live on cattle. One observer gives this period as at least ten days, while another considers they live about twenty days. Their longevity depends upon a number of factors, chief of which appear to be humidity, temperature, and wind. Strong winds, low temperatures, and low humidities are very unfavourable to the adult fly, and when such conditions prevail, the number of flies on cattle are rapidly reduced.

Buffalo flies appear incapable of surviving any length of time away from their hosts. Even under warm, humid conditions very few flies will live for twenty-four hours, whilst under dry conditions their survival does not extend beyond a few hours. With moderately low temperatures, on the other hand, the flies become inactive and may live up to five days. Newly-emerged flies under normal conditions usually die within an hour or so unless they find a host, but, again, low temperatures may extend their survival up to six days.

The range of flight of buffalo flies is unknown beyond the information that it is at least 2 miles. The fact that flies are unable to survive for any length of time away from their hosts, however, would indicate that flight is not of any great importance as a factor in the spread of the pest. This, it is considered, is controlled almost entirely by the movements of infested cattle and probably horses.

How to Distinguish Buffalo Flies from other Flies Occurring on Cattle.

Cattle attract many different kinds of flies. Most of these feed on the sweat, scurf, and secretions of the eyes, nose, and mouth. Others bite and suck blood, such as mosquitoes, sandflies, march flies, the stable fly, and buffalo fly. Many of these flies are much larger than the buffalo fly, e.g., stable flies, march flies, and bush flies; others are much smaller and more delicate, e.g., mosquitoes and sandflies. Indeed, if one relies on size alone, there is only one fly with which the buffalo fly could be confused. This fly is known as *Hydrotaea australis*. It is a small dark-grey, almost black fly, about the same size as the buffalo fly, but of a more robust build. It is exceedingly common, and it is usually seen very busily running over the body of an animal. The buffalo fly, it will be remembered, never crawls or runs over the body when it desires to change its position—it always flies. The wings of *H. australis* are not so iridescent as those of the buffalo fly when seen in sunlight, and are, furthermore, held at a much more acute angle to the body. Finally, a careful examination will show that *H. australis* has a soft, retractile, sucking proboscis, whilst that of the buffalo fly is erect, and stands out from the underside of the head.

In examining cattle for buffalo flies, it is well to remember that the flies can more easily be detected if they are in bright sunlight, when the wings are very iridescent (Plate 6). If a wind is blowing, the flies will be found on the sheltered side of the animal.

Plate 7.

BUFFALO FLY SORES (MARKINGS) AROUND THE EYES AND ON THE SHOULDER.

Plate 8.

EXTENSIVE SORES AROUND SHOULDER AND NECK CAUSED BY BUFFALO FLIES.

Seasonal Distribution.

During the winter months, when normal low temperatures and dry weather prevail, buffalo flies become very scarce. In some localities they apparently die out completely. In other localities, however, where there is shelter from the cold winter winds and a sufficiently high humidity, flies are able to persist throughout the winter in small numbers. Favourable localities for such persistence include, for example, the jungle swamps of the coastal fringe, sheltered permanent waterholes and cattle camps, where large numbers of cattle congregate. The cold winter winds are apparently one of the most important factors in reducing the numbers of the fly. Not only do they lower the temperatures, but they also assist in drying up the dung, and so render it unsuitable for the development of the egg and larva.

During the 1939 and 1940 winters in the Gulf country, flies persisted in relatively large numbers. This is considered to have been due firstly to the excellent summer rains which were responsible for extremely large numbers of flies; and, secondly, to unusually mild and practically windless winters.

Commencing with the spring storms, conditions gradually become more and more favourable to the flies and their numbers increase rapidly. This increase continues to about April and May, reaching its maximum just after the summer rains. Thereafter, as the weather becomes progressively cooler and drier, the number of flies dwindles.

Economic Importance.

The most conspicuous ill effects of infestation among cattle are those which are associated with worry and irritation. Cattle subjected to the irritation of countless bites of feeding flies are unable to feed and rest to the normal extent. Consequently, the animals fail to put on condition as much as they should and, in cases of severe infestations, may even lose condition.

The extent to which an animal suffers naturally depends on the number of flies attacking it. Observations have indicated that cattle can tolerate fairly well populations of 1,000 flies or less, whilst numbers in excess of 1,000 will cause ill effects, and numbers of 2,000 to 5,000 are definitely serious.

It has also been observed that animals exposed to attack for the first time suffer much more severely than animals which are accustomed to the pest. To relieve the irritation caused by the innumerable bites, cattle rub the affected areas vigorously against tree trunks and other objects. This results in the formation of large raw areas (Plates 6, 7, and 8). Although these are only superficial, they are extremely attractive to buffalo flies and other flies, particularly the ubiquitous and very common bush fly (*Musca vetustissima*), which by their constant attendance induce further worry and irritation, and also prevent healing.

Judging from the irritation caused by buffalo flies and from the effect on the milk yield by other biting flies, such as the horn fly (*Lyperosia irritans*) in the United States, and sandflies, mosquitoes, march flies, and stable flies, both in our own country and elsewhere, one must expect that should the buffalo fly ever reach our dairying districts, the effect on milk production would be serious indeed.

Acknowledgment.

The photographs shown in this article were taken by Mr. C. R. Mulhearn, B.V.Sc., Director, Animal Health Station, Oonoonba.

IT COSTS ONLY 6d. TO FEED A CHICK TO 8 WEEKS
ON "HY-PRO"
Red Comb HY-PRO CHICK MASH
NO OTHER FOOD REQUIRED
Just Feed "Hy-pro" and watch them grow
FREE BOOKLET ON REQUEST
Red Comb
RED COMB HOUSE
Roma Street, Brisbane
Red Comb
LAYING MASH
FILLS THE EGG BASKET

Poultry Farming in Queensland.

ORIGIN OF THE DOMESTIC FOWL.

SOME controversy exists as to the origin of the domestic fowl. Darwin advanced the theory that all of our breeds of to-day were offspring of a common ancestor. A species of fowl, *Gallus bankiva,* which is an inhabitant of Assam, Burma, Siam, and several other countries, was selected by him as the common ancestor.

Records indicate that the fowl was common in China 1400 B.C., but it was not introduced into Australia until 1788. Governor Phillip was responsible for the first introduction of poultry in Australia. These landed in January of 1788, and on the 1st May of the same year the poultry population consisted of 18 turkeys, 29 geese, 35 ducks, 142 fowls, and 87 chickens, whereas in 1938 the poultry population consisted of 420,577 turkeys, 97,118 geese, 632,414 ducks, and 15,359,390 fowls.

The first poultry show was held in Great Britain in 1845, but it was not until 1865 that definite standards were drawn up by the Poultry Club of England to which poultry should be bred. The breeding to well-defined standards has undoubtedly done much to improve methods of breeding, but unfortunately many of those interested in poultry bred largely for external characteristics and lost sight of production qualities.

The production qualities of poultry, however, have been brought out by egg-laying competitions. Although records of production may be claimed by many States, to the State of New South Wales must go the honour of pioneering the first test in the world, extending over a period of twelve months. This test was inaugurated in 1901, the average production per bird being 130 eggs. Since then production has gradually increased, and in 1917 it reached an average of 206 eggs per bird, which can be accepted as a fair average of the output per bird to-day. Although nutrition may have played its part, there is no doubt that increased production was materially due to breeding. Laying tests, however, were responsible for some loss of type and vigour and to obtain the greatest value from the fowl, breeding for both type and production must go hand in hand.

Recent Progress.—During the last eighteen years considerable development has taken place in this industry in Queensland. This progress can best be gauged by quoting a few statistics from the Queensland Egg Board.

QUEENSLAND EGG BOARD STATISTICS.

Year.	Eggs Received in Dozen.	Overseas Export in Dozen.
1924	1,445,000	Nil
1925	1,665,000	12,000
1930	3,935,000	831,150
1935	5,489,315	2,152,800
1941	*6,613,035	2,045,430

* Approximate.

The Queensland Egg Board only operates over the south-eastern corner of the State, but similar expansion has taken place in northern

areas. This expansion has been brought about by education, co-operative marketing of the egg through the Queensland Egg Board, co-operative buying of produce through producers' organisations, and by the greater facilities that exist to-day for the replacement of flocks by the modern incubator. Here, however, exists a danger if the rigid selection and culling of the breeding flock is not persisted with.

Value of the Industry.—The true value of the poultry industry is most difficult to determine. For the year 1938, 29,523 agriculturalists indicated that they were engaged in the poultry industry, while the estimated production for the year 1940 was 12,558,608 dozen. In addition, there are many thousands who are interested in the production of their own requirements of eggs and poultry meat.

The value of poultry raising cannot only be viewed from the value of the product of the industry. Its relation to other industries has to be considered. There is no class of animal that receives more care and attention in relation to feeding than the fowl. The fodder requirements of the fowl are derived from other agricultural industries. For every 100,000 fowls in the State, 4,000 tons of fodder are required annually. Grain, mill offal, lucerne chaff, meat meals, and other by-products of primary industries form the diet of the fowl. The part it plays in a well-balanced agricultural industry can readily be gauged.

Legislation.—Although until comparative recent years this industry was small, it now enjoys legislation permitting and controlling—

1. The orderly marketing of eggs.
2. The grading of eggs.
3. The branding of eggs.
4. The cold storage of eggs.
5. The manufacture of frozen egg.
6. The control of poultry disease.
7. The slaughter of poultry for human consumption.
8. The voluntary registration of hatcheries.
9. The licensing of persons engaged in the determination of the sex of day-old chickens.
10. The branding of chickens determined as males by licensed persons.
11. The fixation of commission charges for poultry sold by agents.

Many benefits of such legislation are in evidence.

BREEDS OF POULTRY.

It is impossible to deal with all breeds, and reference will only be made to those that are used to any extent in this State for commercial purposes.

All breeds of poultry readily adapt themselves to the varying climatic conditions along the coastal areas of Queensland, but, as a general principle, it can be taken that what are referred to as heavy or dual-purpose breeds and game breeds are more adversely affected by extremes of heat than those referred to as light breeds, while the light breeds appear to be more adversely affected by extremes of cold than the dual-purpose and game classes.

Extremes of heat, cold, wind and rain are not conducive to the best results with any breed, and consequently protection should be

afforded all classes of poultry against these adverse conditions. Although dual-purpose breeds appear to be more adversely affected by heat than light breeds, it is considered that conditions of housing could be such as to permit of the successful raising of these breeds in the hottest districts of the State.

Commercial poultry may definitely be grouped in three classes, viz.:—

Light Breeds.

Light breeds are usually breeds developed extensively for egg production with little or no attention being paid to table qualities. This class of bird may also be classed as a non-sitter. Among many strains individuals will be found in which the broody trait has not been bred out, but taken collectively they may be classed as non-sitters. Another character of the light breeds is that they are layers of white-shelled eggs.

Among this class Leghorns predominate, with probably the Ancona being the next most popular, followed by the Minorca.

Heavy or Dual Purpose Breeds.

Breeds of this class have been developed for table and egg-producing qualities. Taken as a group they are not as efficient egg producers as the light breeds, but individuals of this class hold the record as egg producers in this State, namely 354 eggs in 365 days. Without exception, all heavy breeds are very docile, whereas light breeds are of a more or less nervous disposition. Breeds of this class may also be referred to as sitters. Every effort is made to breed this characteristic out, and it has been done to some considerable extent by many breeders, but in the best of flocks broody hens will be found. The egg of this class should be brown in colour, although many pale eggs will be found in all breeds.

The most popular breed of this class is the Australorp. The Langshan is probably the next in favour, followed by the Wyandotte, Rhode Island Red, and Sussex.

Game Class.

This is essentially a table class. Although it may not prove profitable to breed game fowls for table purposes, it is found commercially sound to breed birds exclusively for the table, the crossing of any dual-purpose fowl with the game will add to the table qualities of the progeny. This appears the most profitable manner in which the game fowls might be utilised.

Among the game class is the Old English, Indian, and Australian game.

LOCATION AND NAMES OF EXTERNAL PARTS OF THE FOWL.

(With an explanation of parts and faults of the commercial breeds of Queensland.)

ABDOMEN.—The rear portion of the body: that portion not protected by a bony structure.

Faults.—Sagging, hard, due to excessive fat or internal disorders and distended with fluid.

BACK.—The top of the body from the neck to the base of the tail. It should be long, but varies according to the breed. It should also be wide and flat.

Faults.—Narrow, roach, or any deformity.

BEAK.—Both mandibles. The beak should be of medium length, strong, and slightly curved.

Faults.—Long, straight, short, crossed, and parrot.

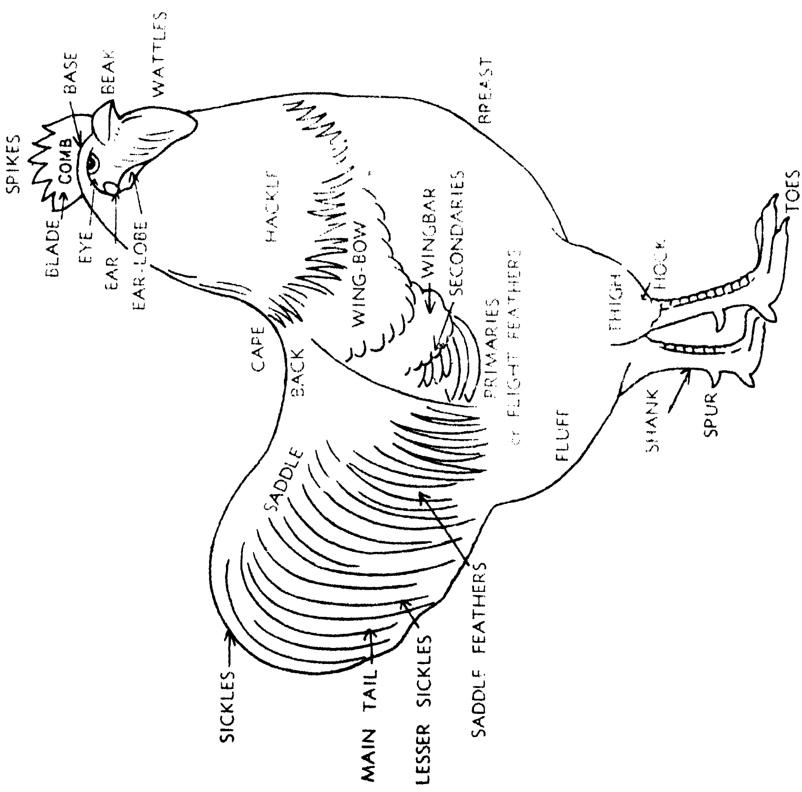


Plate 9.

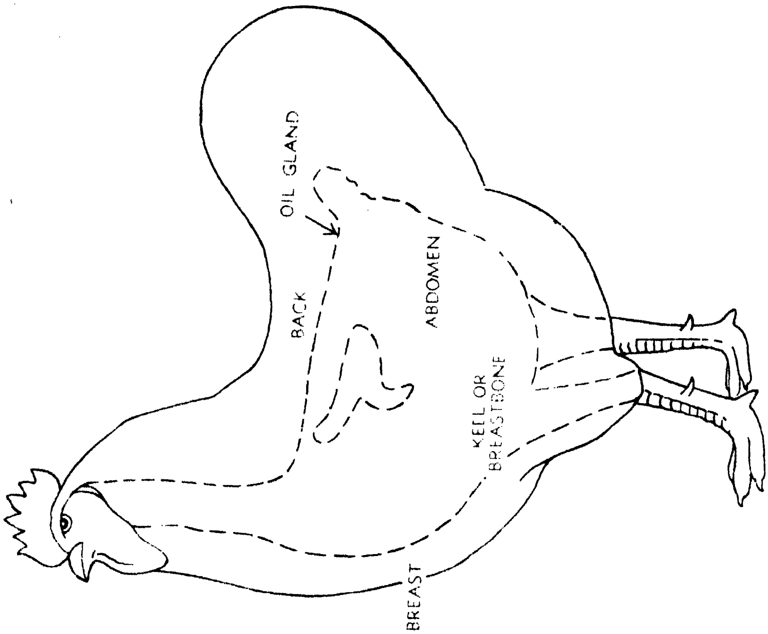


Plate 10.

BREAST.—From the point of the keel to the base of the neck.

Faults.—Cut away, frequently termed "lack of front." Pendulous due to the enlargement of the crop.

COMB.—A fleshy growth on top of the skull. Two types in poultry bred in this State for commercial purposes, viz., Single and Rose. Peacombs are found on Indian Game.

Single Comb.—Single, fleshy, serrated, formation extending from the beak backward and over the head. The serrations should be deep and even, and broad between the points of the spikes. Portions of the comb are referred to as the—

Spikes—The pointed portion on the upper part of the comb.

Blade—The portion of the comb at the rear of the last spike.

Base—The portion of the comb adjoining the head.

Rosecomb.—A low, solid, fleshy mass, covered on its upper surface with small rounded points, frequently referred to as "working," terminating in a well-defined spike at the rear, known as the leader.

Faults.—*Single*—Lopped in males and heavy breed females, erect in light breed females, such as Leghorns, crooked, twisted, thumb marks, coarse, unevenly serrated, and side sprigs.

Rosecomb.—Lopped, smooth, hollow or split centre, twisted or crooked.

EAR.—The organ of hearing, which is situated at the rear of and slightly below the eye. It is protected with a tuft of small feathers.

EAR-LOBES.—The raised skin below the ears. Should be correct size and shape in conformity with the standard, smooth and open.

Faults.—Wrinkled, incorrect size or shape, folded, red in white lobes, white in red lobes, blistered.

EYE.—The eye should be full, round, prominent, bright, and expressive, conforming in colour to the standard of the breed.

Eye-lids.—The eye-lids consist of upper, lower, and a thin white nictitating membrane, which is mainly concealed.

Eye-ring.—The edges of the eye-lids. In a yellow-skinned bird the yellow pigment bleaches out very rapidly from the eye-ring with production.

Faults.—Pupil misshapen; iris incorrect colour. Eyes that give the appearance of being other than round; sunken eyes.

FACE.—The bare or almost featherless area between the lobes and the point of the beak. Should be free from feathers, bright red, smooth, and full.

Faults.—Excessive feathering, skin dark or white, wrinkled, or sunken.

LEG.—Includes the thigh (fleshy part) and shank (scaly part).

Faults.—Bow-legged, in-kneed, and malformations.

NOSTRILS.—The openings at the base of the upper mandible of the beak extending into the head.

OIL-GLAND.—Situated immediately in front of the base of the tail. Supplies oil for the bird's feathers.

SADDLE.—The rear portion of the back, extending to the tail from which the saddle hackle or feathers grow in a male. In a female the feathers are termed the cushion.

SPUR.—The horn-like growth on the shanks of males. A fault in females.

TOES.—There are four toes, three projecting forward and one backward. The toes should be straight, and in length proportionate to the bird.

Faults.—Crooked; enlarged joints.

WATTLES.—The pendant fleshy growths at the sides and base of the beak, conforming with the comb in size.

Faults.—Misshapen, beefy, uneven in size, and any tendency to fold inwards in front.

WINGS.—The upper limbs or arms of the fowl.

Faults.—Carried unevenly or loosely, resulting in the wing being not held in proper position, termed slipwing, associated with twisted and curled flight feathers.

PLUMAGE.

CAPE.—The short feathers underneath the neck hackle coming over the shoulders, collectively shaped like a cape.

CUSHION.—The mass of feathers at the rear of the back of a hen, partly covering the tail, and corresponding to the saddle in the male.

Fault.—In most commercial breeds, looseness of cushion is a serious defect.

FLUFF.—Soft downy feathers around the thighs and the abdomen; the downy part of feathers; the small feathers between the toes of birds.

HACKLES.—The neck plumage of a fowl, or the saddle plumage of a cock, consisting of long, narrow pointed feathers.

LEG FEATHERS.—Feathers projecting from the outer side of the shanks—e.g., Langshans.

SICKLES.—The long, curved feathers of a male's tail.

TAIL.—True tail feathers are long, broad, and stiff. Tail coverts are in front of and at the side of the tail.

Faults.—In tail carriage—squirrel, low and wry.

UNDER-COLOUR.—The colour of the fluff of the feathers.

WING.—*Primaries.*—The outer flight feathers, hidden when the wing is closed.

Secondaries.—The inner flight feathers which are on the outside when the wing is closed.

Wing-bar.—Any line of dark colour across the middle of the wing caused by the colour or marking of the feathers known as the lower wing coverts.

Wing-bay.—The triangular part of a folded wing between the wing-bar and the end of the flight feathers.

Wing-bow.—The upper or shoulder part of the wing.

Faults.—A wing so irregularly formed that it shows a decided gap between the primaries and secondaries.

STANDARDS.

In order to maintain breed characteristics it is essential to have standards to which to breed. Thousands of fowls are bred yearly by producers with little or no consideration being given to type. The departure from type may be attributed in some degree to the exaggerated specimens at times seen on the show bench, and to greater consideration being given by judges to feather markings than to types and egg-producing qualities.

From the one breed in many instances there has been developed two types, namely, the standard-bred fowl and the utility-bred fowl. In trying to perfect his bird from a show point of view the fancier sacrificed egg qualities, while the egg producer in the race to produce eggs sacrificed type. The egg producer sacrificed type to such an extent that commercial breeders years ago drew up a utility poultry standard to be read in conjunction with the standard of perfection as laid down by the Poultry Club of England.

This move has proved of great advantage to the industry, insofar as the improvement in type that has taken place has materially assisted in maintaining the health and stamina of our flocks.

LEGHORNS.

General Characteristics.

THE COCK.

Head.—Skull fine. Beak stout, the point clear of the front of the comb. Eyes prominent. Comb (*a*) single or (*b*) rose: (*a*) perfectly straight and erect, large but not overgrown, deeply and evenly serrated (the spikes broad at their base), extending well beyond the back of the head and following, without touching, the line of the head, free from "thumb marks" or side spikes; (*b*) moderately large, firm (not overgrown so as to obstruct the sight), the leader extending straight out behind and not following the line of the head, the top covered with small coral-like points of even height, and free from hollows. Face smooth. Ear-lobes well developed and rather pendent, equally matched in size and shape, smooth, open, and free from folds. Wattles long and thin.

Neck long, profusely covered with hackle feathers.

Body wedge-shaped, wide at the shoulders and narrowing slightly to root of tail; round and prominent breast; long back sloping slightly to the tail; large wings tightly carried and well tucked up; moderately full tail at an angle of 45 degrees from the line of the back.

Legs moderately long. Shanks fine and round (flat shins objectionable) and free of feathers. Toes (four) long, straight, and well spread.

Carriage very sprightly and alert. There should be no suggestion of stiltiness.

Plumage of silky texture, free from woolliness or excessive feather.

Handling, firm with abundance of muscle.

Weight not less than 6 lb.

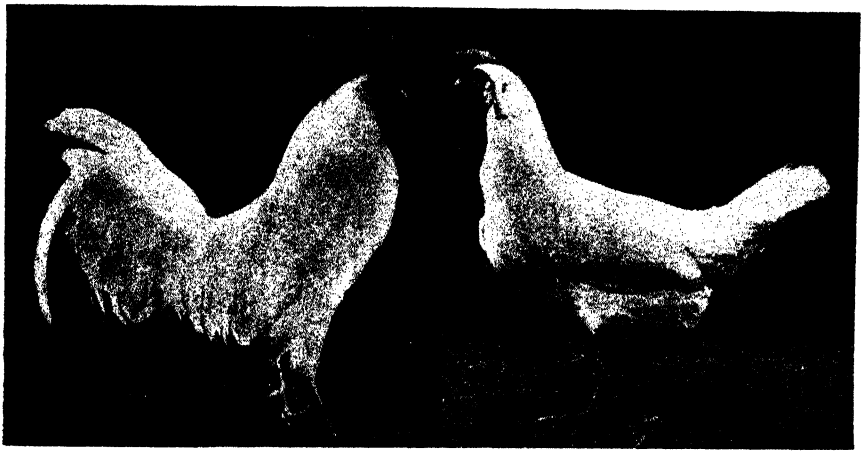


Plate 11.
WHITE LEGHORNS.

THE HEN.

With the exception of the comb (in the single-combed varieties falling gracefully over either side of the face without obstructing the eyesight) and the tail (carried closely and not at such a high angle), the general characteristics are similar to those of the cock, allowing for the natural and sexual differences. Weight not less than 5 lb.

Colour.

Beak yellow or horn. Eyes red. Comb, face, and wattles bright red. Ear-lobes pure opaque white (resembling white kid) or cream, the former preferred. Legs and feet yellow or orange.

THE BLACK.

Plumage.—Rich green-black or blue-black, the former preferred, and perfectly free of any other colour.

THE BROWN.

Plumage of the Cock.—Neck-hackle rich orange-red, striped with black, crimson-red at the front below his wattles. Back, shoulder-coverts, and wing-bow deep crimson-red or maroon. Wing-coverts steel-blue with green reflections forming a broad bar across; primaries brown; secondaries deep bay on the outer web (all that appears when the wing is closed) and black on the inner. Saddle rich orange-red with or without a few black stripes. Breast and under-parts glossy black, quite free from brown splashes. Tail black glossed with green; any white in tail is very objectionable. Tail-coverts black edged with brown.

Plumage of the Hen.—Hackle rich golden-yellow, broadly striped with black. Breast salmon-red, running into maroon around the head and wattles, and ash-grey at the thighs. Body colour rich brown, very closely and evenly pencilled with black, the feathers free from light shafts, and the wings free from any red tinge. Tail black, outer feathers pencilled with brown.

THE WHITE.

Plumage.—Pure white free from straw tinge.

Scale of Points.

THE BLACK.

Head (comb 12, lobes 15)	27
Colour	25
Type	15
Size	15
Condition	10
Legs	8
	100

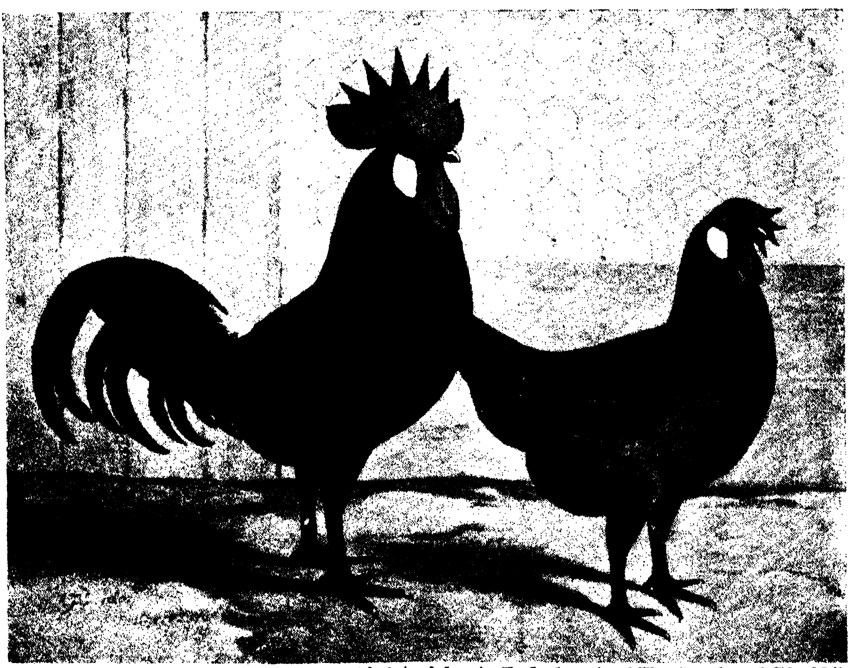
THE BROWN.

Head (comb 12, lobes 16)	28
Colour	20
Type	15
Size	15
Condition	12
Hackle	10
	100

THE WHITE.

Type	25
Head (comb 10, lobes 10)	20
Colour	20
Size	15
Condition	10
Legs	10
	100

Serious Defects.—Cock's comb (single) twisted or falling over, or hen's comb erect; rose comb such as to obstruct the sight; ear-lobe red; any white in face; legs other than yellow or orange; wry or squirrel tail; any bodily deformity. In Blacks, dark legs or eyes. In Browns, white feathers.



[*Original by A. F. Lydon, in "The Feathered World."*

Plate 12.

BROWN LEGHORNS.

As far as is known, the Leghorn originally came from Italy, its name being derived from a town in that country. The characteristics of the present-day Leghorn have been largely fixed by American and English breeders as a result of most careful selection over a long period of years.

There are many varieties of Leghorns, e.g., White, Brown, Black, Buffs, Pile, Blue, Exchequer, Cuckoo, Duckwing (silver and gold), and Mottled.

The Leghorn, more particularly the White Leghorn, is possibly the most popular breed or variety of fowl in the world, and it has maintained this position for at least half a century, and has done so principally due to its prolificacy. Other characteristics of the breed are that it comes into production early in life, and being of a fairly hardy constitution is therefore easy to rear. It is a great forager and is most active and alert.

Although there are a large number of varieties of Leghorns, the White stands supreme in the commercial poultry world, followed in order by the Brown and the Black.

The table quality of the flesh of this breed is not considered equal to that of heavy breeds, although young cockerels meet a fair demand. Their small size is greatly against their economic value.

With regard to size, there are two extremes which are likely to occur when breeding either for exhibition or egg production. When breeding for the former, the general tendency is to increase the size of the breed. This does just as much harm to the Leghorn as the commercial poultry farmer, who, in striving for egg production, breeds from undersized birds. These factors should not be lost sight of when selecting for the breeding pen. Under these circumstances, it is advisable to always bear in mind the standard weights as laid down and be just as harsh with a bird that is overweight, as one that is underweight.

Varieties.

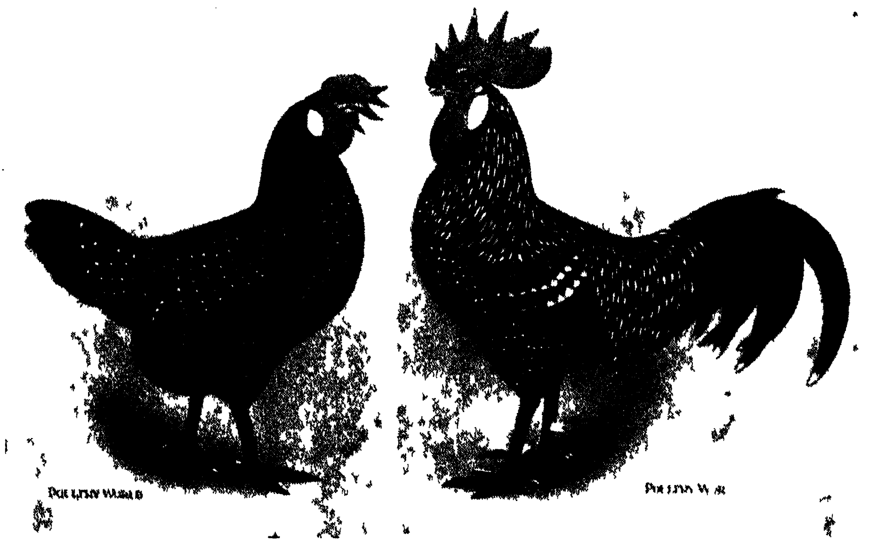
The White.—Possibly this variety will always remain supreme in the Leghorn family because of the ease with which it can be bred for egg production and also for exhibition. When selecting birds for breeding, the individual birds should be balanced up by firstly giving consideration to type, avoiding any exaggerated characteristics. When the actual egg production is known, there is a general tendency to breed from high producers, irrespective of body conformation. This situation is possibly more common among White Leghorns than among all other fowls, as a greater number are tested for egg production.

The Brown.—This variety is difficult to breed true to type and colour. Its popularity has declined of recent years. Some commercial poultry farmers continue with the Brown Leghorn and claim that they are equal as layers to the White.

To produce exhibition cockerels it is necessary to mate an exhibition male with a female that is much too dark for exhibition purposes. To breed exhibition females, matings have to be reversed, mating together an exhibition female and a male very light in colour. It is generally recognised among the poultry fanciers that the exhibition female line are indifferent layers, whilst the females of the exhibition cockerel line are quite good layers. As a commercial proposition the latter could be fostered.

Another fault which is fairly common in Leghorns, but possibly more pronounced in Brown Leghorns, is the eye colour or the colour of the iris. It should be red, but there is a tendency towards straw colour, and even greenish in colour. The latter is a very serious fault, because of the tendency towards shortsightedness or blindness, and birds that are shortsighted cannot be profitable.

The Black.—The Black Leghorn is a good layer, but difficult to breed true to colour. Some breeders resort to double matings for exhibition purposes, but good laying strains could hardly be built up upon this principle. Birds with a good green sheen, free from purple and white in undercolour, should be selected for breeding purposes. White in undercolour is a serious defect which increases with age. Cock birds, sound in undercolour, are particularly valuable. White in wings of young stock is not uncommon, but disappears with the growth of adult plumage.



[*Original by Wippell, in "The Poultry World" (England).*

Plate 13.

THE ANCONA.

ANCONAS.

General Characteristics.

THE COCK.

Head.—Skull moderately long, deep, and inclined to width. Beak of medium length and moderate curve. Eyes prominent. Comb (*a*) single or (*b*) rose: (*a*) upright, of medium size, with deep serrations and five to seven spikes (broad at their base), the outline forming a regular convex curve, the back following the line of the head, free from "thumb marks" or side spikes; (*b*) medium size, low and square front, tapering towards the leader (which should follow the curve of the neck and not be straight out or upwards), the top covered with small coral-like points of even height, and free from hollows. Face smooth. Ear-lobes inclined to almond shape, of medium size, and free from folds. Wattles long and fine.

Neck.—Long, profusely covered with hackle.

Body.—Moderately long, with close and compact plumage, broad front, slightly narrow saddle; full broad breast carried upwards; large wings well tucked up; full tail carried well out.

Legs.—Moderately long. Thighs well apart and almost hidden by the body feathering. Shanks and feet free from feathers. Toes (four) rather long and thin, well spread.

Carriage.—Upright, bold, and active.

Weight.—6 lb. to 6½ lb.; cockerels, 5½ lb.

THE HEN.

With the exception of the single comb, which falls, without obscuring the vision, on one side of the face, the general characteristics are similar to those of the cock, allowing for the natural sexual differences. Weight, 5 lb. to 5½ lb.; pullet, 4½ lb.

Colour.

Beak yellow shaded with black or horn, preferably not wholly yellow. Eyes orange-red with hazel pupil. Comb, face, and wattles bright red, the face free from white. Ear-lobes white. Legs and feet yellow mottled with black.

Plumage beetle-green with white tippings (the latter free from black or grey streaks), the more evenly V-tipped throughout with white the better, but tipped and not laced or splashed. Under-colour black. All the feathers should be black to the roots, with beetle-green surface, and only the tips white.

Scale of Points.

Colour and markings: purity of white, quality and evenness of tipping, 20; beetle-green ground colour, dark to skin, 15	35
Head (comb 10, eyes 5, beak 5, lobes 5)	25
Type and carriage	15
Texture, general	10
Legs, colour	5
Condition	5
Size	5
	100

Serious Defects.—White in face; white or light under-colour; plumage other than black and white; any deformity.

This breed is believed to have originated in Ancona, in Italy.

They are extremely hardy, quick growers, great foragers, and layers of white-shelled eggs. A notable feature of the Ancona is its highly nervous temperament. It is a very handsome, interesting breed, that will more than pay its way commercially. As a table fowl the Ancona is equal to the Leghorn in quality of flesh.

As regards type, they somewhat resemble the Leghorn, though smaller, and lower set, being shorter in thigh. The back is somewhat shorter and not so straight, whilst a characteristic feature of the breed is that the fullness of breast is carried higher than in the Leghorn.

The colour is not just black and white splashes, but calls for white tipping on a black background. The standard calls for feathers to be "V" tipped. The size of the "V" is not defined. This leaves much to the discretion of the breeder. Tipping should be clearly defined without being splashed with black or grey. White flights are fairly common, and very difficult to breed out when aiming at obtaining correctly tipped birds, and due allowance can be made for such a fault.

Light undercolour is a fairly common fault, and is classified as a serious defect, and must be considered as such. Undercolour should be dark right to the skin. The ideal leg colour is yellow mottled with black. Look for definite black mottled (or spots), not patches of black shading, and yellow must predominate (yellow mottled with black).

In breeding it is better to use a male with clean yellow legs than one in which the black predominates; the latter will tend to produce a preponderance of blacklegged females.

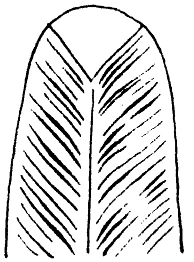


Fig. 1.—Correct Tipping.

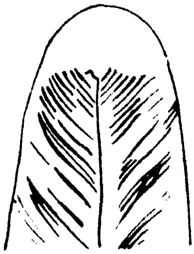


Fig. 2.—Incorrect Tipping.

Plate 14.

ANCONA FEATHER SHOWING CORRECT AND INCORRECT TIPPING.

MINORCAS (Non-sitters).

General Characteristics.

THE COCK.

Head.—Skull sufficiently long and broad to provide a substantial foundation for the comb. Beak stout, fairly long. Eyes full, bright, and expressive. Comb (*a*) single or (*b*) rose: (*a*) medium size, perfectly straight, upright and rigid, not extending over the point of the beak, the back following without touching the line of the neck-hackle, nicely arched, and evenly serrated with preferably five wedge-shaped spikes, free from "thumb marks" or side sprigs; (*b*) medium size, firm, low, and square front, oblong shape, tapering towards the leader (which should follow the curve of the neck and not be straight out or upwards), the top covered with small coral-like points of even height, free from hollows. Face smooth, the skin taut (wrinkles objectionable), as free as possible from feathers or hairs. Ear-lobes almond-shaped, medium size, widest part on the top, more elongated than round, of kid-like texture, flat and of firm substance, fitting closely to the head and not extending over the face, and without any tendency to hollowness, slackness, or roundness. Wattles long, of oval shape, and fine texture.

Neck.—Long, hackle extending well down to body.

Body.—Broad-shouldered, fairly long, and compact with a deep keel and straight breastbone; horizontal carriage; rather long back; full round breast; fairly long wings carried closely to the sides and with broad flight feathers; fully furnished tail with long, broad, and nicely curved sickles, and set on at an angle of 45 degrees.

Legs.—Of medium length, but without any tendency to stiltiness. Shanks strong but fine bone, free of feathers, straight and wide apart, no tendency to "knock-knees." Toes (four) long, fine, and well spread.

Carriage.—Upright, active, and alert.

Weight.—6 lb. to 8 lb.

THE HEN.

With the exception of the single comb (which is carried gracefully over one side so as not to obstruct the sight), the general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—5 lb. to 7 lb.

Colour.

THE BLACK.

Beak dark horn. Eyes dark. Comb, face, and wattles blood-red, the face totally devoid of white or blue skin. Ear-lobes perfectly white. Legs and feet black or very dark slate, the latter in adult birds only.

Plumage.—Brilliant green-black.

THE WHITE.

Beak white. Eyes red. Comb, face, and wattles blood-red. Ear-lobes white. Legs and feet pink-white.

Plumage.—Lustrous silver-white.

Scale of Points.

The Single Comb.

Head (face 15, comb 15, lobes 10)	40
Colour (plumage 10; legs, eyes, and beak 8)	18
Type	17
Size	15
Condition	10
	100

Serious Defects.—White or blue in face; wry or squirrel tail; feathers on shanks or toes; other than four toes; side sprigs on comb; plumage other than black or white; legs other than black or dark slate in Blacks, or white in Whites.

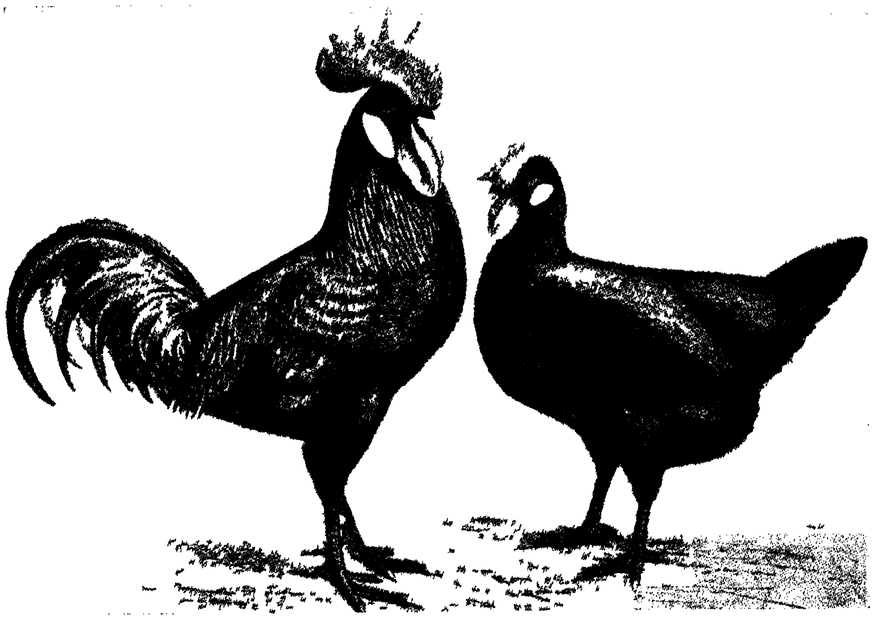


Plate 15.

MINORCAS.

There is little known of the origin of this breed. It is generally accepted that the Minorca is a descendant from the Castilian fowl. Its name is derived from the Island of Minorca, off the East Coast of Spain, from where the first importations into Britain were made.

The Minorca is a good layer and has the inherent characteristic of laying large eggs. It is generally accepted that the average weight of eggs laid by this breed is heavier than eggs laid by any other breed. The eggs, having white shells, are most attractive in appearance and appeal to the average housewife.

The Minorca is possibly the largest of the Mediterranean or light breeds, and being white skinned is attractive when dressed for table

purposes. However, there are some objections to it as a table bird, namely, that it has black pin feathers.

The Minorca, although well known, has not been persevered with to any extent by commercial poultry farmers. Backyard poultry keepers who have a preference towards white shelled eggs would find the Minorca admirable for this purpose.

This breed is noted for its long back, the shoulders being broad and the body reasonably deep and having somewhat of an oblong, compact appearance as the feathering is fairly close. The male has a sloping back with a reasonably long flowing tail which sets off its body and gives it a somewhat racy and active appearance. The back of the female is nearly horizontal, and the tail carried fairly low.

The breed is also noted for their large combs, wattles, and the outstanding characteristic of large white earlobes. The comb should not be excessively large and beefy. Smallness of earlobes is another common fault, more particularly among our utility Minorcas.

Varieties.

The Black.—The black is common in Queensland. Little difficulty is experienced in breeding this variety. There are some characteristics, however, that must be guarded against. Some of the principal faults are as follows:—Light coloured eyes, such as reddish or hazel, in-knees, light undercolour, small lobes.

There is also a tendency towards white in face or blue in face, but these points are not quite so common as those previously mentioned. The standard calls for a brilliant green sheen on the plumage. The plumage, as a general rule, particularly in the female, is a dull black colour. At one time purple sheen, or barring, was fairly prevalent. This fault has practically been bred out, but should always be avoided where possible in the selection of breeding stock.

The White.—This variety is very uncommon in Queensland.

[TO BE CONTINUED.]

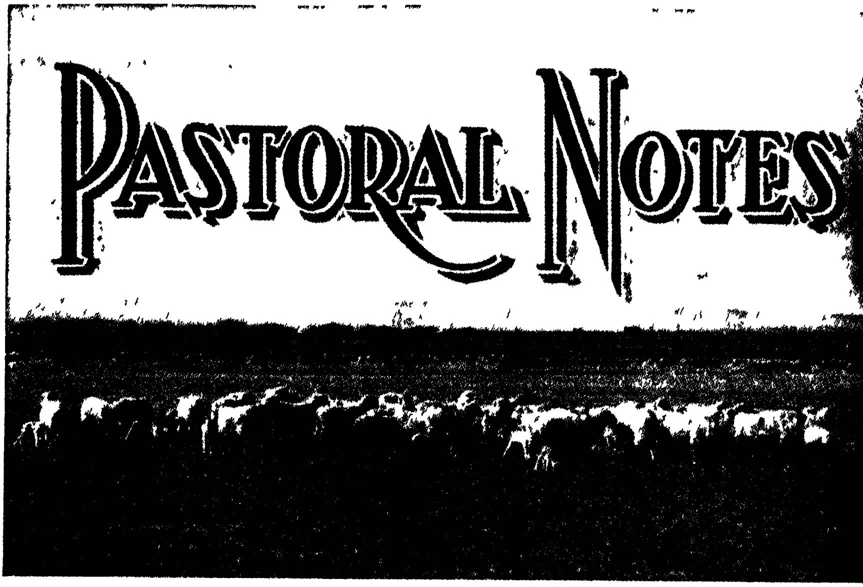
THE FEEDING OF FOWLS.

The domestic fowl appears to have no sense of smell and but little of taste. The senses of sight and touch, however, are very keenly developed, so that it becomes important to prepare poultry foods in an attractive form. The fowl relies largely on past experience in accepting food, and for that reason feeding problems must be always a subject of close study.

Excessively fine, dusty foods—e.g., some biscuit meals—should never be fed without some preliminary treatment. They tend to cause clogging in the mouth, and fine particles lodged in the respiratory tract are a source of irritation. There also is the additional danger of distended crops. Such dry foods should be incorporated carefully in a mash and, if necessary, moistened.

A food which is flaky, but not brittle, is well taken by fowls—hence the popularity of bran in mashes. Hard grains should be crushed or ground coarsely. Soaking is an alternative method of helping the gizzard to cope with hard foods.

Predigested, fermented, or malted foods are actually lower in nutritive value than the material from which they are derived and, in normal circumstances, should not be purchased.



Parasitic Worms in Calves.

DURING autumn and winter worms may prove very troublesome among calves, especially in dairying districts. The worms are picked up from the pastures during the summer, and, as the grass dries off and becomes less nutritious during the autumn and winter, the effects of the infestation become evident.

The first symptom of worm infestation in calves is a loss of condition, accompanied by occasional attacks of scours. As time goes on the animals become decidedly poor in condition and anaemic. They frequently show a paleness of the membranes of the eyes and mouth, a dropsical swelling under the skin of the jaw (bottle jaw), and are continually scouring. The coat becomes rough and staring, and eventually the animal becomes too weak to stand, and lies down and dies.

The control of worm diseases in calves may be successfully accomplished by paying attention to nutrition and feeding, prevention of infestation, and treatment.

Feeding.—It is generally recognised that an animal in a well nourished condition is able to withstand the ravages of worms to a much greater degree than an animal whose diet is poor. As already pointed out, worms are most troublesome among calves during the period when the pastures are dry and contain little nutriment. Furthermore, the losses are greatest among the "poddies" in the dairy herd, whose feeding frequently receives insufficient attention. Much good can, therefore, be done by the supplementary feeding of calves during the autumn and winter.

Prevention of Infestation.—Calves become infested when they pick up the worm larvæ as they graze in the pastures. The worm larvæ arise from eggs which are passed out from infested animals in the dung. Moisture is essential for the development of the worm eggs and the existence of the larvæ. Therefore, in order to break the cycle and so lessen the degree of infestation, clean up the manure as often as practicable; make use of a system of paddock rotation in which calves are continually moved from one pasture to another, or are grazed alternately with horses; and avoid the use of swampy pastures, selecting for the calves only those paddocks which are well drained.

Treatment.—At present little is known of the treatment of calves for worms. Bluestone will, however, remove the large or twisted stomach worm, which is one

of the most troublesome of calf parasites. This drench is made by dissolving 1 lb. of fresh bluestone in 5 gallons of water, and the dosages are as follows:—

Calves, four months, 1½ fluid oz.; calves, six months, 2 fluid oz.; calves, nine months, 3 fluid oz.; calves, twelve months, 4 fluid oz.; calves over twelve months, 6 fluid oz.

No starvation is required. The calves should be given two drenches with an interval of fourteen days during April or early May. A further drench should be given in June and again in July.

RED-WORMS IN HORSES.

Red-worm disease is one of the most important diseases of horses in Queensland. The disease is caused by the presence of large numbers of red-worms, which inhabit the first part of the large bowel. These worms vary in size from about ½ inch to 1½ inches in length and, in a freshly-killed carcass, may be found adhering to the membrane on the inside of the bowel. Their reddish colour is due to the fact that the worms suck blood.

If the worms are numerous, the infested animal does not thrive well, the coat becomes rough, and loss of condition and weakness follow. Diarrhœa is frequently present, and in severe cases the blood becomes thin, the eyes become sunken, the whole appearance of the animal becomes very dejected, and finally death may supervene. The symptoms are gradual in their onset, and the disease may thus be in an advanced stage before it attracts the attention of the owner.

The worms do not multiply within the bowel, and each one of the many thousands that may be present has been picked up as a young worm from the pastures. These young worms in the pastures have arisen from worm eggs which have been passed from the body of the horse in the dung. As these young worms may live among the grass as long as four years, a paddock on which horses are permanently grazed may become heavily infested.

The most efficient drug for the treatment of red-worm disease is oil of chenopodium, which may be most easily administered after mixing with raw linseed oil, by means of a bottle or a drenching bit. The animal to be treated should be starved for thirty-six hours before, and for four hours after the administration of the drug. The oil of chenopodium is given at the rate of 1½ drams for every 250 lb. live weight in 1 to 2 pints of raw linseed oil. Oil of chenopodium is a highly poisonous drug and those wishing to use this treatment are advised to get in touch beforehand with the Animal Health Station, Yeerongpilly. In areas possessing a high rainfall, three or four treatments should be given during the year.

In addition to treatment, an attempt should be made to prevent reinfestation. For this purpose, it would be better not to graze horses continually in a single paddock, particularly if it is swampy. Attention should be given to the regular collection of manure from stables and yards. Heavy stocking is not to be recommended, and young horses (up to three years) should, if possible, be kept away from pastures that have been much grazed by horses.

A TICK-CAUSED CATTLE DISEASE.

Anaplasmosis is a disease of cattle which is caused by a minute blood parasite. Under natural conditions it is spread by the tick. When cattle are inoculated for tick fever, it happens frequently that they show signs of sickness about a month to six weeks after the inoculation. This was often recognised by stockowners and was called the "second reaction." It is now known that this second reaction is due to an entirely different organism from the one that causes ordinary tick fever or redwater.

The chief symptoms are dullness and a disinclination to feed. This lasts for a week to ten days, during which the animal may lose much condition. Jaundice is also seen. Sometimes the animals take a long time to recover completely.

Although the anaplasm is widely distributed throughout the tick-infested area of Queensland, outbreaks of anaplasmosis in the field are unusual. Just recently, however, attention has been drawn to two or three instances of deaths occurring in dairy cows in which inquiry and examination have shown that the mortality was due to anaplasmosis.

Treatment is of little value. It is best to leave the animal alone. Driving the animal is particularly harmful. A mild purgative is useful. Drastic drug treatment of any kind is to be avoided.

Dairy Pastures.

EFFICIENT production is the only form of economic production, and this perhaps applies more to dairying than to any other primary industry.

Efficiency is achieved by ensuring that cows receive the right food in the right quantities. The cheapest means of filling the first requirement is by herd testing and culling, since by this method only high-producing cows are maintained on the farm.

Nowadays, the value of dairy land is judged not by the number of cows it will carry but by the butter-fat production per acre. Once this idea is fixed in mind it becomes obvious that the higher the cow's yield the more economic a producing unit she becomes. Low producers mean reduced output and reduced efficiency in the working of the farm.

As the dairy cow is required to produce large quantities of milk which is rich in protein, it follows that it must be given foods which are likewise rich in protein. There is little difference between the food values of the various popular cultivated grasses, which in the early stages of growth are equal in protein content to many valued concentrates. The young shoots are very rich in this respect, and this accounts for rapid recovery of cattle grazing on pastures after rain following spells of dry weather, or after a burn.

Here, then, is a natural food for the dairy cow readily available. It is economic, too, because with a little care it can be produced in large quantities and it requires no labour in feeding. The dairy pastures, then, deserve special attention to maintain them at an efficient standard. There are several ways of maintaining and improving pastures, namely:—

(1) The growing of grasses which have a high feeding value;
(2) Top dressing pasture land;
(3) Rotational grazing, or, in other words, feeding the grass while in its young stage of growth;
(4) Renovation of pastures.

In selecting grasses, attention must be given to their adaptability to local conditions, period of growth and production, nutritive value, palatability, and suitability for grazing and haymaking. The length of the grazing season is increased and the returns improved by the use of top dressing. Its practicability depends on the increased returns in terms of cash.

Rotational grazing does not involve so great an outlay and is more a matter of pasture improvement by ensuring the economical use of herbage. The subdivision of holdings to provide rotational grazing appears to offer a ready means of immediate benefit through pasture management. And now is the time to act. It will be too late to achieve any advantage if it is left to make a start when the season turns dry.

SCOURS IN CALVES.

The most common ailment of calves, and one of the chief causes of unthriftiness and mortality, is scours. The disorder may manifest itself in one of several forms—viz., common scours or scours caused by indigestion; blood scours; white scours. Preventive measures should always be observed in calf-rearing, for to cure it is a difficult matter.

Common scours or scours caused by indigestion, the most common type, is a digestive disturbance resulting from errors in management and feeding. The chief factors in its causation are:—

(1) Irregular feeding times;
(2) Feeding milk at improper temperatures;
(3) Over-feeding or under-feeding;
(4) Unclean feeding vessels, yards, or sheds;
(5) Sudden changes in feeding;
(6) Feeding sour or unclean milk;
(7) Too rapid feeding.

A failure to take food, indicating loss of appetite, or diarrhoea, should be regarded as presumptive symptoms, and if a calf shows these symptoms the above and other points in management should be carefully checked over and any necessary adjustment made. A common error in treatment is to immediately apply methods calculated to check the disorder, by administering astringents which have a binding effect. Instead of this, the bowels should be opened to get rid of offending material, and for this purpose castor-oil, given in doses of 1 to 3 oz., depending on the size of the calf, is suggested; at the same time, cut down the ration to half. While ordinary scours is not contagious, it is a good practice to separate sick calves from the others so that they may be watched and given proper treatment.

Blood scours, recognised by the bowel discharges being discoloured by blood, is highly contagious, and immediate isolation of the affected calves is therefore essential. A leaflet on this ailment is obtainable on application to the Department of Agriculture and Stock.

White scours is due to infection by a micro-organism, and attacks calves at birth or soon after they are dropped. Isolation is necessary to prevent the spread of infection to other calves in the herd. The destruction of dead carcasses by fire should be first done, followed by thorough disinfection of the shed and pen surroundings in which the infected animals had been kept. The local stock or dairy inspector should be consulted for further advice.

SELECTING A DAIRY HEIFER.

In the selection of a dairy heifer, the form and general character will, to a great extent, indicate whether she will develop into a good producer. When a heifer is quite young, the trained eye of the judge can see its dairy value and can discern the dairy type as distinct from the beef type. The production records of her ancestral dams on both sides are important factors in determining her future dairy value, while constitution is also important.

The form of the heifer with a future as a profitable producer is, in miniature, that of a good type, fully-developed dairy cow. Dairy characteristics are indicated by an absence of surplus flesh; she is somewhat angular and spare. The head is typical of her breed, the eyes large and bright, and muzzle large, ears of average size, neck lean and lengthy, sloping with the shoulders. She is sharp over the shoulders, ribs well sprung, with good heart girth. The forequarters are light. Digestive capacity is indicated by the depth through the barrel from the centre of the back to the navel. Good depth indicates ample capacity to convert food into milk. The greater the depth through the middle the greater the production is likely to be. The back is straight. There is a good length from the hip to the pin bones, and from the hip to the flank. The thighs are flat and free from fleshiness; the line of the thigh is incurving. The bones should be light and not coarse. The tail should be thin and free from flesh. All of these points should indicate that there is no tendency to lay on flesh.

The udder (as yet undeveloped), milk veins, and wells are reliable indications of the heifer's future value as a dairy cow. The skin covering and surrounding the immature udder is soft and loose with teats well placed. The milk veins can be followed with the finger and milk wells gauged. Comparatively well-developed milk veins and large milk wells also are important points in judging a dairy heifer.

Name and Address.	Name of Hatchery.	Breeds Kept.
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	Australorps
W. Brown, Waterworks road, The Gap, Ashgrove	Strathleven ..	White Leghorns
W. T. Burden, 44 Drayton road, Toowoomba	Harristown ..	White Leghorns, Australorps, and Rhode Island Reds
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca.. ..	White Leghorns and Australorps
W. C. Carlow, Brookfield ..	Adaville ..	Australorps, White and Brown Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlinton ..	White Leghorns
W. Chataway, Cleveland ..	Wilona ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
Mrs. M. M. Cousner, The Gap, Ashgrove	Progressive Poultry Farm	Australorps and White Leghorns
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, Rhode Island Reds and Whites
O. M. Dart, Brookfield	Woodville ..	White Leghorns, Australorps, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros. ..	White Leghorns
T. Duval, Home Hill	Athalie ..	White Leghorns and Rhode Island Reds
E. Eckert, Head street, Laidley	Laidley ..	Australorps, Langshans, and White Leghorns
Elks and Sudlow, Beerwah ..	Woodlands ..	White Leghorns and Australorps
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner ..	Australorps
B. E. W. Frederich, Oxley road, Corinda	Glenalbyn ..	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
C. and C. E. Gustafson, Tannymorel	Bellevue ..	White Leghorns, Australorps, and Rhode Island Reds

Name and Address.	Name of Hatchery.	Breeds Kept.
F. E. Hills, Sims road, Bundaberg	Littlemore ..	Rhode Island Reds, Australorps, White Wyandottes, White Leghorns, and Langshans
A. E. Hoopert, Greenwattle street, Toowoomba	Kensington ..	Australorps, Rhode Island Reds, and White Leghorns
C. Hodges, Kuraby	Kuraby ..	White Leghorns and Anconas
A. E. Hoopert, 24 Greenwattle street, Toowoomba	Kensington ..	Australorps and Rhode Island Reds
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
Miss K. E. Jenkins, Phillip street, Sandgate	Brooklands ..	Australorps, White and Brown Leghorns
S. W. Kay, Cemetery road, Mackay	Kay's Poultry Stud	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
W. A. Lehfeldt, Kalapa ..	Lehfeldt's ..	Australorps
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps, White Leghorns, and Light Sussex
J. McCulloch, Whites road, Manly	Hinde's Stud Poultry Farm	White and Brown Leghorns and Australorps
W. S. McDonald, Babinda ..	Redbird ..	Rhode Island Reds and Ançonas
F. W. McNamara, Vogel road, Brassall, Ipswich	Franmara ..	White Leghorns and Australorps
A. Malvine, Junr., Waterworks road, The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White and Black Leghorns
A. E. Mengel, Campbell street, Toowoomba	Glenmore ..	White, Black, and Brown Leg-Leghorns, Anconas, Australorps, and Rhode Island Reds
C. Mengel, New Lindum road, Wynnum West	Mengel's ..	Australorps
J. A. Miller, Charters Towers ..	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	White and Brown Leghorns and Australorps
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor	Ferndale ..	White and Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Coopers Plains	Norups	White Leghorns and Australorps
C. O'Brien, Hugh street, Townsville	Paramount ..	White Leghorns and Rhode Island Reds
H. Obst and Sons, Shepperd ..	Collegeholme ..	White Leghorns and Rhode Island Reds
A. C. Pearce, Marlborough ..	Marlborough ..	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, and Langshans
E. K. Pennefather, Douglas street, Oxley Central	Pennefather's ..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farms	White Wyandottes, White Leghorns, Brown Leghorns, Australorps, Rhode Island Reds, Langshans, and Light Sussex
G. R. Rawson, Upper Mount Gravatt	Rawson's ..	Australorps
J. Richards, P.O., Atherton ..	Mountain View	Leghorns and Australorps
W. G. Robertson, Bilsen road, Nundah	Ellerslie ..	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa Stud Poultry Farm	White Leghorns and Australorps
W. B. Slawson, Camp Mountain	Kupidabin ..	White Leghorns, Australorps, and Light Sussex
Mrs. A. Smith, Beerwah	Endcliffe ..	Australorps and White Leghorns
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Australorps
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. G. Teitzel, West street, Aitkenvale, Townsville	Teitzel's ..	White Leghorns and Australorps
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns, Australorps, and Rhode Island Reds
P. and K. Walsh, Pinklands, via Cleveland	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's ..	Australorps, White and Brown Leghorns, Anconas, Minorcas, Rhode Island Reds, Indian Game, and Bantams
H. M. Witty, Boundary road, Kuraby	Witty's ..	White Leghorns and Anconas
P. A. Wright, Laidley	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps

BLACK COMB IN FOWLS.

Black comb disease in poultry occurs frequently throughout the State from October to March. It usually affects laying hens, and is responsible for heavy losses to the industry either by death or decreased egg production.

Where treatment is prompt the mortality does not appear to be as extensive as when treatment has been delayed. Again, early treatment appears to assist in getting affected birds back into production much more quickly than when it has been deferred.

The first indication of the disorder is a bird's pronounced loss of appetite, followed in the course of a few hours by a darkening of the comb. In fact, it is not uncommon for 25 per cent. of the flock to have a very darkened comb within twenty-four hours of the first sign of the trouble.

In the early stages of this disease, the temperature of sick birds rises. This induces thirst. As the disease develops, little desire for water is in evidence, and as treatment for this trouble is given by means of the drinking water, the necessity for prompt action is obvious.

On further examination of the sick birds it will be found in most cases that the crop is full an indication of the suddenness of the attack. This condition of the crop has caused many breeders to attribute the trouble to the food and water. As the disorder advances the legs of the Leghorns particularly become very much darkened in colour; and if the feathers of a bird of any breed are turned back, the skin will be found to be darker than usual. Diarrhœa has been observed in some cases, but it is not apparent in all affected flocks.

The mortality from this disorder appears to be governed largely by the general condition of the flock, and the rapidity with which treatment is applied. Where prompt measures have not been taken, losses have been as high as 20 per cent.; but where early treatment is given deaths have been as low as 1 or 2 per cent. The loss from deaths, however, is not the only important factor. Egg production has been observed to fall from 60 to 5 per cent. within six or seven days.

Treatment.—Several proprietary mixtures are used with apparently beneficial results, but in preference to deferring treatmnt until these mixtures are procurable, the breeder is recommended to administer Epsom salts to the birds in the drinking water at the rate of 1½ to 2 oz. to the gallon.

Establishing Lucerne.

LUCERNE is grown for hay purposes chiefly in warm districts on deep calcareous soils provided with abundant moisture. In such situations heavy crops are produced over a number of years. Within recent years the cultivation of lucerne has been extended into fairly dry districts, but most success may be expected on soils rich in lime and with ample moisture available to the plants.

Land intended for lucerne is best cropped with a cereal—such as wheat, oats, barley, or rye—or panicums and millets—prior to its preparation for lucerne. Stubbles should be cultivated to induce volunteer growths of weeds and other seeds; these should be turned in subsequently by ploughing. For a first cultivation, two deep ploughings should be given at right angles to each other. Moisture should be conserved by frequent cultivation. In dry districts, where a good rainfall cannot always be depended upon at seeding time, fallowing is particularly necessary for the purpose of conserving moisture. The land may therefore be ploughed in late autumn or early winter the year before it is intended to sow. The depth of the ploughing is governed by the character of the soil. Alluvial soils should be ploughed to a depth of about 7 inches, but on other classes of soil of lighter or more porous nature a depth of 4 to 5 inches is sufficient. The ploughed land should then be allowed to lie in the rough state for a month or so and be broken down with harrows after summer rains. During summer the land should be frequently worked with harrows or cultivators, so as to allow neither growth of weeds nor the formation of a hard crust on top. If the seed-bed cannot be worked down sufficiently fine with the harrows, a one-way disc cultivator or roller will do all that is necessary. If the land is rolled, it should be harrowed immediately after the rolling. Where the soil surface shows a tendency to dry out just prior to sowing, a light ploughing may be given and followed by the harrows. Sowing on top of the harrowed surface, followed either by a light rolling or by brush-harrowing, is a good practice—but if rolling is adopted, a set of light harrows should be used immediately afterwards. Rolling assists in bringing the soil particles in closer contact with the seed and works in the same manner as compressing a partly dried-out sponge.

Lucerne is best sown in April or May, the young plants then being sufficiently well established before the onset of cold weather to enable them to survive. Provided the seed is drilled in, a sowing rate of 12 to 14 lb. per acre is ample, and often too much, in the best lucerne-growing districts. If hand broadcasting is practised, slightly more seed should be used. The rate of seeding should be lighter in dry districts, and for grazing purposes a seeding of as low as 2 lb. per acre is permissible. Seed sown on the surface should be covered by means of a light harrowing.

Though fertilizers are not used to any considerable extent in the main lucerne-growing areas, many growers have obtained payable results by applying up to 1½ cwt. of superphosphate per acre, either drilled in with the sesed or used as a top-dressing. Nitrogenous fertilizers appear unnecessary.

Fully a month or six weeks will pass before the young root system becomes established and the lucerne is fit for its preliminary cutting by the mower. An

early mowing before the young lucerne flowers acts as a pruning and stimulates the root growth. After the preliminary cutting, a light harrowing may be made if absolutely necessary because of foreign growths.

Often promising stands of lucerne, following good germination, are destroyed through cutworm attacks. Damage at this time is irreparable, for the blank spaces are filled with weeds which considerably lessen the value of the crop. The Paris green-bran cutworm bait broadcast at the rate of 30 lb. per acre gives effective control, provided it is distributed as soon as the depredations of the pest become apparent. The necessary materials should therefore be held in stock on the farm for emergency. Cutworms attack only very young lucerne and intelligently applied baiting is then quite safe. Bait distribution in established crops is undesirable on account of the possible risk of stock poisoning.

PREPARATION OF WHEAT LAND.

Widely distributed rains since December have enabled farmers to go on with the preparation of wheat lands. Fields ploughed during December will now be in good physical condition, provided weed growth has been controlled by judicious cultivation.

Where sheep have access to the fallowed areas weeds will not be troublesome, but elsewhere every effort should be directed towards the eradication of all such growths. If it has been possible to control weed growth, all workings following the initial ploughing can be done entirely with rigid tine cultivators, or spring-tooth implements, and with harrows. Cultivation to the desired depth in order to break the crust and form a good surface mulch should be done soon after all substantial rains. As a firm seed-bed is required, it is important to progressively reduce the depth of working towards seeding time, particularly where sheep are not available to assist in consolidation.

Well prepared land containing ample reserves of moisture is often fit for sowing at a seasonable period, according to the variety selected, independently of favourable rains. On the other hand, hurriedly prepared land may have to await later rains to effect germination—a great disadvantage, for early or seasonably sown crops invariably give the best average returns.

The wheat yield for the 1937 season exceeded the average annual return for the previous decade, despite somewhat adverse seasonal conditions, a fact which can be attributed largely to the increased attention being given to the thorough preparation of the land. The growers who consistently practise summer fallowing have been amply rewarded for their efforts during recent years when winter and spring rains have been under average, a fact which cannot have escaped the attention of neighbouring farmers.

Where wild oats and other weeds are assuming pest proportion, it is suggested that the land be sown to a good fodder oat, which can be grazed as required, ploughing in the residue in sufficient time to prevent the maturity of wild oat seed.

Weed infestation during the following year can thus be greatly reduced, besides providing valuable feed, and a rotation crop of benefit to the land.

WINTER AND SPRING FODDER CROPS.

For winter and spring feed in coastal areas which have a fair winter rainfall, the winter cereals, wheat, oats, barley, and rye, are strongly recommended. If these crops are combined with a legume such as field peas or vetches, the nutritive value of the fodder is greatly enhanced.

Sowings of these crops may commence now, with successional sowings during May, if desired. If seasonal rains are delayed, sowings may be extended to early July, but with such late sowings the crops will only be available for a short period.

In the absence of seed drills, broadcasting is usually adopted, sowing the legume first, and discing or cultivating in; following with the cereals which are broadcast and harrowed in.

Suitable varieties are Florence, Warren, or Warchief wheat; Sunrise, Belah, or Algerian oats, and Skinless barley. Florence wheat, 30 lb., combined with Dun field peas at the rate of 20 lb. per acre, has proved a suitable mixture, as both are early maturing. Algerian oats, 30 lb., combined with vetches at the rate of 20 lb. per acre, is also a suitable combination, particularly for early sowing, as this mixture is considerably slower in maturing than the former. The early maturing varieties of oats, such as Belah and Sunrise, may also be sown with field peas if desired.

If individual crops are sown, the following rates of seedling per acre are recommended; wheat 60 lb., barley 50 lb., oats 50 lb., rye 50 lb., field peas 40 lb., vetches 30 lb.

The crop should be cut and fed direct to stock as, where grazing is practised, wastage occurs through trampling.

Rape may also be grown during the autumn and winter months to provide an abundance of succulent feed, which is particularly fattening for both sheep and pigs. Rape is not so suitable for dairy cattle, owing to the taint which it sometimes may impart to milk, and to its tendency to induce bloat.

Rape may be sown from March to May, drilling in 4 to 5 lb. of seed per acre. Broadleaf Dwarf Essex is the variety favoured.

The root crops, mangels, sugar beet, Swede turnip, and kohl-rabi, may also be sown on well prepared land from February until May.

A "Planet Junior" cultivator and seeder is a useful implement for this work, the seed being sown in rows 2½ feet apart, and the plants being thinned out to 1 foot intervals. Sow mangels and sugar beet at the rate of 5 to 7 lb. per acre, Swede turnips 2 to 3 lb., and kohl-rabi 2 lb.

THE SWEET POTATO.

The sweet potato is not cultivated in Queensland to-day to the extent that its usefulness warrants. At one time it was used largely on the householder's table, but it is now a rarity.

When questioned about the shortage of sweet potatoes for table use, the farmer usually replies, "There is no demand for them." This is true only in part, but the demand still exists for the right varieties. A dry floury, or a moderately moist, potato will suit the consumer best. No doubt, some of the good varieties in use in the past are not now available, owing to droughts and irregular planting, but many are still to be found in certain localities. If the planting is confined to varieties which have proved popular with the consumer, and which could be sold on name, the demand for them should be continuous. Under present conditions a householder may buy sweet potatoes which are unpalatable. If, however, consumers realised that there were different types and varieties of sweet potatoes, they would learn very soon to purchase only types which they liked.

Market gardeners should, therefore, cultivate varieties for which they could readily find buyers. Some market gardeners are already doing this with good results. Very watery or stringy varieties are both undesirable. It is a mistake for a grower to allow a portion of his crop to stand over after maturing, as the tubers then begin to deteriorate in quality.

Sweet potatoes are easy to grow, and can be raised on a variety of soils, the period of growth from planting to harvesting being approximately three months. The period of planting is dependent very largely on the locality; in most parts along the coast it may extend from October until the end of February. The crop must mature before the frost commences. The crop does not require a big rainfall —in fact, excessive moisture is detrimental to good results, in that it increases the growth of vines, and lessens the crops of tubers.

The most satisfactory method is to plant a few medium-sized tubers in a nursery bed of good friable soil, which is mulched in order to retain moisture and promote rapid growth, and to pick cuttings as growth progresses. A bed of fifty selected tubers planted in this way will provide many thousands of cuttings. The alternative, and less satisfactory, method of obtaining planting material is to procure cuttings from an old plot, which is usually neglected. The terminal cutting from the vine is generally regarded as giving the best results. The land is set up in ridges 3 feet apart. The cuttings should be 12 to 15 inches in length, and planted on the ridge to a depth of approximately 6 inches, cuttings to be set from 20 to 24 inches apart. On well-prepared soil weeds should not be troublesome, and little attention will be necessary until harvesting.

A good crop of sweet potatoes will yield 20 tons of tubers to the acre. Several of the old varieties were known by different names in various districts. A classification of all varieties grown in Australia was carried out in recent years by an officer of the Department of Agriculture and Stock, and cuttings of a known type, together with a number of new seedling varieties, were distributed in different agricultural districts of the State. Some recommended varieties for planting for table use are Gold Coin, Seedling No. 3, Brook's Gem, and Snow Queen.

It is advantageous to the grower to market the tubers in a clean and attractive condition.

The Citrus Bud Mite.

CERTAIN types of malformation on citrus trees, known in Queensland orchards for many years and often attributed to red spider, are now known to be due to another and much smaller mite frequenting the buds. This mite, which closely resembles, and may be identical with, a similar pest recorded in New South Wales and California, has been termed the citrus bud mite.

The injury takes the form of a distortion of growing points, leaves, flowers, and fruits. Growing points are often twisted, leaves exhibit grotesque forms, flowers frequently do not open properly, and fruit may not set. A number of common fruit malformations, particularly of lemons, are probably due to this pest. Multiple budding is also a symptom of bud mite infestation, numerous short, rather weakly shoots, giving a characteristic bunched appearance to the young growth.

Microscopic examination of the buds shows a black or brownish discolouration of the scales and, on mature wood, the buds are frequently dead.

The mites themselves are very small worm-like creatures, about 1/200 of an inch in length and creamy-white in colour. The eggs are minute, spherical, and pearly-white. All stages of the mite are, of course, too small for detection by the naked eye. The mites are most numerous in the unopened buds, but occasional specimens have been seen on the outside of buds. At times, they are also abundant beneath the buttons of the fruit.

The mite has been recorded from a number of districts in coastal and subcoastal areas, ranging from Ayr in the North to Gayndah, Maroochy, and Maleny in the South, and it probably occurs in all the more important citrus districts of the State.

Damage has been particularly severe between spring and mid-summer during the last two years. Whether mite activity is normally at its maximum in the first half of the season is not yet known. In 1940, growth after the early February rains was quite normal in most areas and mites were far less prevalent at this time than in the previous October-December period. High temperatures cause a marked reduction in the mite population in New South Wales, and the very hot weather at the end of January (1940) probably had the same effect in Queensland.

Lemons in the Gayndah district and Solid Scarlet mandarins in the coastal areas have suffered most severely, but similar damage has been observed on at least a few trees of most varieties grown in the districts under observation. Mandarins, however, other than Solid Scarlets, appear to be less susceptible to injury than lemons, oranges, and grapefruit. The status of this newly-discovered

pest cannot yet be accurately assessed, but at present it may be considered of minor importance. The damage can, however, be serious in young trees for growth is checked and additional pruning is necessary to remove the many surplus shoots which, if allowed to develop, would ruin the plant.

The effect of the usual pest control measures on the mite is not yet clear. There is some reason to believe that the low dosage fumigation practised at times in the Gayndah district for the control of the larger horned citrus bug does not kill the mites. Sulphur dust appears to give a satisfactory kill and normal growth has been observed on heavily-infested trees after the application of a lime-sulphur spray during the spring. There is also some evidence to show that a dormant strength (1-15) lime-sulphur spray applied in late winter is an important factor in reducing bud mite damage in the following spring and summer. Until further information is available growers should on no account omit this spray from their pest control programme. In addition, if young growth at any time of the year shows symptoms of infestation, either a lime sulphur spray (1-20 to 1-35, depending on the weather) or sulphur-hydrated lime dust (1-1) should be applied as a safeguard. If bud mite damage is evident on the spring growth of young trees in the nursery, the plants may be sprayed liberally with lime sulphur, as strong as the state of the trees and the weather conditions will permit.

THE CHOKO.

The choko is a popular vegetable, grown largely in Queensland for both market and home use. It has the advantage that, once planted, it comes into bearing each year from the original root. The plant will die down only during the coldest months, and in the spring will shoot again from the tuber which is formed under the ground.

The choko requires a rich loamy soil to which has been added a heavy dressing of well-rotted stable manure. Additions of dried blood and bone dust, or of manure during growth, are of great benefit, as, being a perennial and a heavy feeder, the choko's food requirements are considerable.

The method of planting the choko differs a great deal from that used for other varieties of the same family. Whole choko fruits are used as planting material, the growth coming from a shoot from the kernel in the fruit. The fruit should be planted on the side with the broad end sloping downwards and the stem end slightly exposed.

A trellis is essential to satisfactory growth, though, if planted near a fence or old stump, the plants will spread over it very quickly. When chokos are grown commercially it pays to erect a suitable trellis. This may be done with good logs or rough timber. Sometimes an ordinary "T" trellis is used, over which strong fencing wire is stretched.

A good permanent trellis may be constructed as follows:—Two rows of strong posts are set firmly in the ground with a height of about 6 feet 6 inches above the surface, the rows being about 9 feet apart and the posts about 8 feet apart in the rows. The tops of the posts support cross timbers on which strong fencing wire is stretched with about 18 inches between the wires to carry the vines. Stays support the outside posts, and wires for trellising also should be stretched upon these.

The choko takes some months to come into full bearing, but will commence to bear fruit generally some four to five months after planting. The plants appear to improve with age when properly cultivated and manured.

There are two varieties, the green and the cream. The cream-coloured variety is the more popular.

Chokos should be picked fresh and, after having been peeled, should be cut into suitable portions and boiled or baked.

FERTILITY OF THE HOME GARDEN.

Intensive gardening demands a higher degree of soil fertility than does ordinary field crop culture. An efficient system of soil management therefore should not only make allowance for the present crop but should aim at an ever-increasing reserve of fertility. To achieve this end a plentiful supply of organic matter is essential.

Organic matter improves both the physical condition of the soil and its water-holding capacity. It also helps to modify extremes of soil temperature. In

addition to providing some of the better known mineral constituents required by the plant, organic matter provides certain other necessary elements, usually not considered in the preparation of artificial fertilizers. Some heavy acid soils which fissure badly on drying can often be improved in texture by liming and the addition of organic matter.

The richer the food of animals the richer will be their excreta. Urine contains a great deal of the nitrogen and potash but only a small proportion of the phosphate excreted by the animal, and all three substances are in a form which is readily available for the plant. It is therefore important to realise that unless precautions have been taken to include the urine with the solid excreta the value of the manure is much less than it should be.

Horse manure is richer than cow manure, since the mineral requirements of the milking cow are much greater than those of the horse.

Poultry manure, when fresh, is a richer fertilizer than horse or cow manure. It contains more than twice as much nitrogen and phosphate, but has only about the same amount of potash. The bulk of its nitrogen is present in an easily available form, hence it is a quick-acting or forcing nitrogenous manure.

Animal manure, as commonly procurable, has not been carefully conserved, and must be regarded as an unbalanced fertilizer which should be supplemented by the application of artificial manures to the crop.

An annual application of 100 to 150 lb. per 100 square feet is usually necessary to maintain the fertility of the garden soil.

THE EGG PLANT.

The egg plant is easily grown and produces an excellent culinary vegetable. It is grown similarly to the tomato, and like that plant is very sensitive to cold. It requires a light, rich, loamy, well-drained soil, and poorer ground may be improved by the addition of a 1-4-1 mixture of sulphate of ammonia, superphosphate, and sulphate of potash at the rate of about 5 cwt. to the acre, or by heavy dressings of well-rotted stable manure to which a small quantity of superphosphate has been added.

For an early crop the seed may be sown under cover during July and August; and, when all danger of frost is over, the plants should be set out about 2 feet apart in rows 3 feet apart. Difficulty may be experienced with transplanting, and, it is sometimes desirable to sow the seed in the permanent positions for the plants after all danger of cold weather has passed.

Cultivation and plenty of water are necessary for the plants, as they do not recover readily after a check in growth. Staking in a similar manner to tomatoes may be practised, while, as soon as the fruits are formed, they should be thinned out to leave only eight or ten to each plant. The fruits are harvested when from 4 to 6 inches in diameter. The time from seed planting to transplanting is approximately two months, and from seed planting to mature fruit five months. The best variety is the New York Purple Spineless.

For cooking the fruit should be cut into slices and fried in butter, the slices having been covered first with salt. If being boiled or baked, the fruit should be seasoned with butter, pepper, and salt.

VEGETABLE CROP ROTATION.

The necessity for the rotation of crops in any particular plot of land must be patent to every observant market gardener. Not only does crop production fall off when the same crop is planted several times in succession, but pests and diseases frequently become worse in each succeeding crop.

In working out any system of rotation the following general rules may be taken as a guide.

1. Plants belonging to the same natural order should not succeed one another. For example, tomatoes, potatoes, and the egg plant belong to the same order, and should therefore not be grown after one another in the same land.

2. Plants grown for their roots or tubers should not be succeeded by others grown for the same purpose, as, for example, carrots, turnips, and beet.

3. Crops occupying the soil for a long period should be followed by quick-maturing crops.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

A STUDY of the markets in Southern capital cities shows clearly that the lessons of past years have not been heeded by every supplier. The usual winter batch of reports of immature pineapples, papaws, and tomatoes are coming to hand. Every Queensland grower should by now know the handicaps caused to his industry by attempting to market fruit not of the right maturity standards. Carry-overs and sluggish sales are the usual results, monotonous in their regularity. Time, labour, outlay, including transport costs, are all involved, so obviously only consignments which are welcomed by buyers should be sent. It is a waste of time, energy, and money to despatch unsaleable goods to any market. The timber supply also is involved, and fruit cases are too scarce to be used in conveying fruit to the dump.

Fruit does not colour and ripen at all satisfactorily outside the orchard fence in the winter time. It should, therefore, be left unpicked to colour; this has been proved both by experiment and practical marketing experience.

Many lines of papaws are arriving in Brisbane too green, and much fruit is wasted before consignments colour sufficiently for satisfactory sale. The same thing applies to pineapple consignments to Sydney and Melbourne. In the colder months of the year no risk of over-ripeness is entailed, so growers are strongly advised to let colour develop in the fruit before harvesting.

Prices during the last days of June were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Smalls, 8s. to 12s.; Sixes, 9s. to 13s.; Sevens, 9s. to 14s. 6d.; Eights and Nines, 10s. to 15s.; Bunch fruit, 2d. to 9d. per dozen.

Sydney.—Cavendish: Sixes, 10s. to 14s.; Sevens, 14s. to 17s.; Eights and Nines, 16s. to 19s.

Melbourne.—Cavendish: Sixes, 13s. to 15s.; Sevens, 14s. to 16s.; Eights and Nines, 15s. to 17s.

Adelaide.—Cavendish: 16s. to 18s. per tropical case.

Newcastle.—Cavendish: Sixes, to 14s.; Sevens, 15s. to 16s.; Eights and Nines, 16s. to 18s.

Brisbane.—Lady Fingers, 2d. to 10d. per dozen.

Brisbane.—Sugars, 3d. to 6d. dozen.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 7s. case; 1s. 6d. to 4s. dozen; Ripleys, 3s. to 4s. 6d. case; 4d. to 2s. 6d. dozen.

Sydney.—Smoothleaf, 7s. to 10s. case; specials higher.

Melbourne.—Smoothleaf, 9s. to 11s.; specials higher.

Adelaide.—Smoothleaf, 15s. to 18s. case.

Newcastle.—Smoothleaf, 8s. to 10s. case.

Papaws.

Brisbane.—Local, 2s. 6d. to 4s. 6d. bushel; Yarwun, 4s. to 6s. tropical case; Gunalda, 4s. to 5s. bushel case.

Sydney.—7s. to 12s.; Special coloured lines higher.

Melbourne.—8s. to 12s. case; some lines green and unsaleable.

Newcastle.—10s. to 12s.

Custard Apples.

Brisbane.—2s. 6d. to 3s. 6d. per half-bushel. Demand steady for quality fruit.

Sydney.—4s. to 6s. per half-bushel.

Melbourne.—5s. to 7s. per half-bushel.

Newcastle.—4s. to 5s. per half-bushel.

Passion Fruit.

Brisbane.—First grade, 7s. to 11s.; seconds, 3s. to 6s.; slow of demand.

Melbourne.—Queensland, 10s. to 12s. half-bushel.

Strawberries.

Brisbane.—6s. to 10s. dozen boxes; specials, to 16s. dozen.

Sydney.—12s. to 21s. dozen boxes; trays, 3s. to 7s.; some adversely affected.

Newcastle.—14s. to 18s. dozen boxes; trays, 7s.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels, 4s. to 8s. per case; Commons, 3s. to 6s. per case. Demand slow.

Mandarins.

Brisbane.—Emperors, 3s. to 8s.; Glens, 5s. to 13s.; Scarlets, 4s. to 8s.

Melbourne.—Emperors, 8s. to 11s.; Glens, 10s. to 14s.; Ellendales, 10s. to 14s. Heavier consignments coming forward from all States.

Grape Fruit.

Brisbane.—3s. to 7s. bushel.

Sydney.—6s. to 10s.; specials higher; large sizes wanted.

Melbourne.—7s. to 12s. bushel.

Lemons.

Brisbane.—6s. to 13s.; specials higher.

Melbourne.—7s. to 10s. bushel.

TOMATOES.

Brisbane.—Green, 1s. 6d. to 5s. half-bushel; coloured, 4s. to 8s. Green fruit is hard to sell, and a perusal of prices will show producers that money is lost through marketing green fruit.

Sydney.—Redlands, 3s. to 8s.; a few choice lines to 12s.; Bowen, 6s. to 10s.

Melbourne.—Queensland, 7s. to 8s.; repacked, to 10s.

Newcastle.—Green, 5s. to 6s.; choice coloured higher.

VEGETABLES.

(Brisbane prices unless otherwise stated.)

Beans.—10s. to 14s. sugar-bag; inferior lower; Sydney, 8s. to 15s. bushel; Newcastle, 5s. to 10s. case; Melbourne, 6d. to 7d. lb.; Adelaide, 10d. to 1s. dozen lb.

Peas.—10s. to 14s. sugar-bag; some specials higher.

Cauliflowers.—Small, 1s. to 3s. dozen; large, to 9s. dozen.

Cabbages.—2s. to 4s. dozen; prime quality, to 8s. dozen.

Carrots.—3d. to 1s. 6d. bundle.

Marrows.—1s. to 3s. dozen; sales slow.

Beetroot.—6d. to 1s. bundle.

Rhubarb.—6d. to 1s. bundle.

Cucumbers.—6s. to 8s. bushel case; 9d. to 2s. dozen.

Pumpkins.—3s. to 4s. bag.

Chokos.—4d. to 6d. dozen.

English Potatoes.—2s. 6d. to 5s. sugar-bag.

Sweet Potatoes.—1s. 6d. to 2s. 6d. sugar-bag.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Ayrshire Cattle Society, production charts for which were compiled during the month of May, 1941 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Alfa Vale Model 4th (365 days)	W. H. Thompson, Nanango	19,106·25	847·215	Reward of Fairfield
Dorravista Peggy	J. F. Evans, Malanda	10,945·15	376·818	Monarch of Tarzali
Ruby of Hawthorn (254 days)	R. J. Couchman, Warra	9,372·71	374·373	General of Croydon
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Rocklyn Laura (222 days)	V. A. Wyvill, Yarralea, Upper Yarraman, *via* Yarraman	7,299·5	391·496	Kurrajong Reddie's Beau
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Navillus Vision 4th (365 days)	J. C. Meier, Mt. Mort	16,766·95	672·258	Alfa Vale Renell
Cedargrove Pearl 2nd	P. D. Fiechtner, Pilton View, Greenmount	7,185·5	271·337	Cedargrove Trump
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Pilton View Lady Prim	P. D. Fiechtner, Pilton View, *via* Greenmount	7,381	291·027	Navillus Venie's Sheik
Rocklyn Rose	D. Birch, Redleigh Stud, Memerambi	7,206·55	269·408	Kurrajong Reddie's Beau
Brooklands Mona	J. F. Wyvill, Middle Creek, Sarina	7,491	255·78	Springlands Kinsman
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Navillus Princess 8th	C. O'Sullivan, Navillus, Ascot, *via* Greenmount	7,033·5	294·296	Alfa Vale Prince Henry
Tara Tia 2nd	R. J. Knight, Barkworth, Milmerran	7,196·6	275·943	Murray Bridge Pansy's Gift
Braemar Annabelle	W. Henschell, Yarranlea, Pittsworth	7,947·86	274·926	Blacklands Gay Lad
Navillus Show Girl	C. O'Sullivan, Navillus, Ascot, Greenmount	7,171·25	273·062	Alfa Vale Prince Henry
Roshill Rosette 2nd	W. Flesser, Boyland	6,462·4	234·831	Dnalwon Count
Rocklyn Connie 2nd	D. Birch, Redleigh Stud, Memerambi	5,523·15	234·073	Chelmer Limelight

ERRATA.

The cow previously given as Navillus Daphne 2nd. should read :—

JUNIOR, 2 YEARS.

Navillus Daphne (273 days)	C. O'Sullivan, Ascot	7,332	295·512	Alfa Vale Prince Henry

The figures given for Alfa Vale Doris should read :—

MATURE COW.

Alfa Vale Doris (273 days)	W. H. Thompson, Nanango	14,972·95	665·182	Reward of Fairfield

JERSEY.

MATURE COW (STANDARD, 350 LB.).

Trecarne Jersey Queen 2nd	T. Petherick, Lockyer	9,450·2	571·105	Trinity Some Officer
Trecarne Chimes 2nd	T. A. Petherick, Lockyer	8,959·1	569·945	Trecarne Golden King
Glenmoore Jesters Maybell	J. and R. Williams, Glenmoore Stud, Kingaroy	7,564·25	430·385	Wheatlands Jester (Imp.)
Glenmoore Jesters Charm	J. and R. Williams, Glenmoore Stud, Kingaroy	7,660·65	415·864	Wheatlands Jester (Imp.)
Fauvic Double Gay	H. Cochrane, Fauvic, Kin Kin	7,084·95	390·606	Condong Double Prometheus
Annette of Calton	W. Bishop, Kenmore	7,636·12	366·762	Retford Glory's King 2nd

SENIOR, 4 YEARS (STANDARD, 330 LB.).

Trecarne Dairymaid	T. Petherick, Lockyer	9,584·45	701·236	Trinity Some Officer

JUNIOR, 4 YEARS (STANDARD, 310 LB.).

Iris of Gem	W. Bishop, Kenmore	9,848	504·653	Lace's Volunteer of Ardroy
Keystone Lavina	E. J. Keys, Proston	8,357·65	468·799	Gunawah Gamboge Prince
Bellgarth Bertha 3rd	P. Kerlin, Glenrandle, Killarney	5,103·2	313·977	Trecarne Renown 2nd

SENIOR, 3 YEARS (STANDARD, 290 LB.).

Trecarne Eileen 7th	T. Petherick, Lockyer	6,952·8	482·91	Trinity Some Officer
Prudence of Gem	W. Bishop, Kenmore	8,629·12	371·173	Lace's Volunteer of Ardroy

JUNIOR, 3 YEARS (STANDARD, 270 LB.).

Trinity Sheila 2nd	E. J. Keys, Proston	6,607·7	314·968	Trinity Royal Sovereign
Oxford Carmen	W. G. Berderow, Fairney View	4,765	275·837	Oxford Golden Peer

SENIOR, 2 YEARS (STANDARD, 250 LB.).

Trecarne Dairymaid 3rd	T. A. Petherick, Trecarne, Lockyer	6,280·9	426·497	Trecarne Victor 2nd
Overlook Bonnie Lena 2nd	J. Sigley, Millaa Millaa	5,619·25	250·000	Overlook Nancy's Bonaparte

JUNIOR, 2 YEARS (STANDARD, 230 LB.).

Oxford Lavender	E. Burton and Sons, Wanora	7,534·5	427·209	Oxford Peer
Glenview Rejoice	E. P. Fowler and Son, Glenview, Coalstoun Lakes	4,776·6	282·494	Trinity Governor's Hope
Glenview Miriam	F. P. Fowler and Son, Glenview, Coalstoun Lakes	5,055·25	275·487	Trinity Governor's Hope
Glenview Starbright (255 days)	F. P. Fowler and Son, Glenview, Coalstoun Lakes	5,170·75	273·432	Trinity Governor's Hope
Maurfield Bravo's Hazel	G. Tilley, Beaudesert	5,182·9	267·893	Rosecliff Bravo's Master
Glenview Gaiety	F. P. Fowler and Son, Glenview, Coalstoun Lakes	5,047·1	236·893	Trinity Exchange

AYRSHIRE.

JUNIOR, 2 YEARS (STANDARD, 230 LB.).

Benbecula Gay Girl	M. J. Brownlie, Fairhill, Oakey	5,051·6	287·763	Myola Jean's Monarch

General Notes

Staff Changes and Appointments.

The following have been appointed cane testers for the 1941 sugar season at the mills specified:—Messrs. L. J. G. Becker (Racecourse Mill), C. J. Boast (Mount Bauple), T. V. Breen (Invicta), T. P. Brown (North Eton), L. Chadwick (Moreton), P. H. Compton (Mourilyan), T. F. Corbett (Fairymead), T. D. Cullen (Qunaba), L. G. F. Helbach (Proserpine), T. Herbert (South Johnstone), J. Howard (Rocky Point), H. C. Jorgensen (Tully), J. Macfie (Bingera), S. McRostie (Kalamia), P. J. Phelan (Inkerman), W. Richardson (Babinda), W. Trulson (Pleystowe), R. D. Woolcock (Maryborough); Mesdames L. Keane (Mossman), and E. Macaulay (Cattle Creek); and Misses D. Bowder (Millaquin), E. Christsen (Pioneer), A. L. Levy (Gin Gin), M. A. Lyle (Marian), M. A. Morris (Farleigh), I. Palmer (Mulgrave), and P. Thorburn (Isis).

The following have been appointed assistant cane testers for the 1941 sugar season at the mills specified:—Messrs. P. C. Boettcher (Kalamia), C. Boone (South Johnstone), A. Byrne (Moreton), L. C. J. Clifton (Tully), W. C. Cocking (Inkerman), H. R. Dark (Pleystowe), J. D. Kinnon (Pioneer), J. Mackenzie (Farleigh), C. M. Martin (Gin Gin), J. H. Murtagh (Maryborough), F. Pinch (Plane Creek), P. A. Van Lith (Proserpine), and S. Wilson (Maryborough); Mrs. M. E. Nally (Qunaba); and Misses A. Anderson (Millaquin), F. Atherton (Racecourse), K. Backhouse (Mulgrave), E. A. Crees (Bingera), P. G. Eadie (Babinda), F. Foubister (Pleystowe), K. M. O'Brien (Fairymead), M. Osborne (Mulgrave), E. M. O'Sullivan (Moreton), P. Southwick (Babinda), M. Whitla (Fairymead), S. Wilkinson (North Eton), and F. M. Wilson (Plane Creek).

Mr. S. T. W. Hartley, temporary inspector under *The Diseases in Plants Acts*, has been appointed an inspector, *Diseases in Plants Acts*, Department of Agriculture and Stock, Brisbane.

Mr. C. Schindler, inspector, *Diseases in Plants Acts*, Wallangarra, has been appointed also an inspector under *The Diseases in Poultry Acts.*

Sergeants J. E. Cunneen (Cardwell), J. C. Davis (Mundubbera), and Constables J. Geraghty (Wooroorooka), S. F. Brace (Cecil Plains), and R. E. Goodwin (Kuranda) have been appointed also inspectors under *The Slaughtering Act.*

Mr. T. Craik (Stewartdale, Ripley, via Ipswich) has been appointed an honorary protector under *The Fauna Protection Act.*

Messrs. W. J. J. Short (chairman of the Sugar Board), E. A. Crosser (Assistant Under Secretary, Treasury Department), and J. Seymour (Assistant Parliamentary Draftsman) have been appointed advisory members of the Queensland Emergency Supplies Committee.

Mr. R. P. Cross (Marmor) has been appointed an honorary protector of fauna.

Sergeant D. Wallace (Jundah) has been appointed also an inspector under *The Slaughtering Act.*

Messrs. M. R. Harrison (Margaret street, Toowoomba), J. McGregor (Cooby Creek, Kleinton), and F. Deuble (Wetalla) have been appointed honorary protectors of fauna.

Miss P. Southwick has been appointed a canetester for the present sugar season at the Inkerman Mill, Home Hill.

Mr. D. Walton has been appointed cane tester at the Plane Creek mill for the current sugar season.

Miss L. Beet has been appointed assistant cane tester at the Tully Sugar mill in place of Mr. B. N. Stuart.

Mr. P. B. McGovern, Assistant (Biometry), has been appointed Assistant Biometrician, Department of Agriculture and Stock.

Poisoning of " Weed " Trees and Undergrowth.

In a note under this heading in the May issue of the *Journal* it was stated that arsenic pentoxide is obtainable from the Prickly-pear and Noxious Weeds Section of the Department of Public Lands, Brisbane, at the concession rate of 5s. per 20-lb. tin, f.o.r. The price quoted should have read 7s. 6d. per 20-lb. tin, railage free to nearest railway station or siding.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

"Stinking Rodger." A Thorn Apple Species.

R.T.M. (Chinchilla)—

The plant with the "minty smell" is Stinking Roger (*Tagetes glandulifera*). This plant is very common as a weed on coastal farms, but in recent years, especially during the past good season, has made its appearance as far west as the Warrego district. It is an aggressive farm weed, and as you have only a small patch its eradication is recommended.

The plant with the prickly pod is *Datura ferox*, a species of Thorn Apple or Stramonium. Plants of this genus are generally regarded as poisonous to stock. Most of the poisonous property is found in the seeds. As your particular species is a very bad pest in some parts of the Darling Downs and Maranoa districts, and as you say you have only a small patch of it, its eradication is recommended.

A Native Grape.

H.F.N.F. (Toowoomba)—

The specimen is a native grape (*Cissus hypoglauca*). This is moderately common in some of the scrubs of south-eastern Queensland. The berries are not known to be poisonous, but are very astringent. They also have a somewhat irritating effect on the mouth and tongue, due probably to the presence of crystals of calcium oxalate, which occur in the fruits of several native grapes.

Luminous Plants.

W.P. (Nambour)—

I am in receipt of your letter of the 5th instant. The light given off by the fungus you observed is due to a property of certain plants and animals, called chemoluminescence. This term in itself does not give one much information about the origin of the light, except that it indicates that the light is due to a chemical reaction. In addition to certain fungi several kinds of bacteria and some animals such as fireflies have the property of emitting light. Those who have investigated the subject consider that the light emitted in fungi, bacteria, and animals is derived from a similar source in each instance. From luminescent animals a substance called *luciferin* has been isolated. Luciferin is described as a nucleo-albumin-like substance and would, therefore, be similar, in a chemical sense, to one of the principal constituents of egg yolk. Luciferin, or a substance like it, is considered to be present in luminescent plants. The luciferin or luciferin-like substance becomes luminescent when it is acted upon or oxidised by an enzyme. The process is connected with respiration or the energy-liberating process in the luminescent plants and animals.

Many of the luminescent bacteria are found in decaying wood. Several years ago, when we were at Mount Spec, near Townsville, we were delighted by the spectacle of the rain-forest floor alongside the tracks being luminescent. All of the debris from the trees covering the forest floor was glowing with the peculiar silvery light.

The bell-shaped fungus you describe sounds like a species of *Thelephora*, which occurs in the shape of megaphones of varying sizes on logs. If you wish to be sure of its identity it would be best to send us a specimen.

Thorn Apple.

E.S. (Glenore Grove)—

The specimen is *Datura stramonium*, Thorn Apple, also known as Stramonium. It is sometimes called Castor Oil Plant, but is quite different from the true Castor Oil, which is also naturalised in Queensland. All parts of the plant are poisonous and deaths of working horses are known to have been caused by chaff containing datura stalks and seeds.

A Rattlepod.

O.L.H. (Rockhampton)—

The specimen of legume is *Crotalaria striata*, a rattlepod. This plant has a very wide distribution over the tropics, and in India and Ceylon is sometimes grown as a green manure for tea. The plant has been condemned in Queensland at different times of poisoning stock, but so far as we have observed it is eaten to a very limited extent. Feeding experiments at Darwin showed the plant to be the cause of deaths of goats about the town. The poisonous principle is apparently destroyed by drying, as it was found the plant lost all its toxicity even after being cut for a few hours. The bark has a strong fibre.

Black Wattle. "Evolvulus."

K.E. (Chinchilla)—

The specimens forwarded with your letter of the 10th instant have been identified as under—

1. *Acacia Cunninghamii*, named after Allan Cunningham, the botanist-explorer of the Darling Downs. It is commonly called Black Wattle in Queensland, though in New South Wales this name is given to a very different species.

2. *Evolvulus alsinoides*, a small plant of the Convolvulus or Morning Glory family, for which I have not heard a common name. The generic one, "Evolvulus," however, is short enough for general usage. We have a native Forget-me-not but it is quite a different plant. The flowers are rather insignificant but otherwise quite similar to the Chinese Forget-me-not cultivated in gardens.

I would be very pleased to name any specimens you care to send from time to time.

Grasses Named.

C.E.T. (Boompa)—

1. *Bothriochloa intermedia*, Forest Blue Grass. This is an excellent all round pasture grass, especially for cattle, in the mixed native pasture in Queensland. In many localities it is the dominant species.

2. *Capillipedium parviflorum*, Scented Top. A grass rather similar to the last, but coarser, and probably not so valuable.

3. No seed-heads on this specimen, but we should say it is the Bunch Spear Grass (*Heteropogon contortus*). This grass is liked by stock in its young stages, but it soon becomes harsh and unpalatable and possesses a rather nasty "spear" seed. The name "bunch spear" comes from the fact that the seed-heads often become entangled to form clumps or bunches.

A Native Vine.

C.T. (Brisbane)—

The specimen collected at Cooloolabin, near Yandina, is *Freycinetia propinqua*, one of the handsomest of our native vines. It belongs to the Screw Pine family (Pandanaceae), of which two genera are found in Australia—namely, Pandanus (trees) and Freycinetia (vines). The genus commemorates Louis de Freycinet, the famous French navigator, who visited Australia in 1819.

"Shot Grass" or "Sago Grass."

R.S.D. (Augathella)—

The specimen is the Shot Grass or Sago Grass (*Paspalidium globoideum*). This grass has a very wide distribution in Queensland, especially on black soil country. It is an excellent fodder, relished by all classes of stock, both in seed and in the young stage. Once introduced, it tends to spread naturally. All seed-eating birds are very fond of the grass and take a heavy toll of the seeds.

"Finger Flower."

H.S. (Stanthorpe)—

The specimen is *Cheiranthera linearis*, a small plant of the Pittosporum family (*Pittosporaceae*), with a fairly wide distribution in Eastern Australia, but nowhere very abundant. "Finger Flower" is the local name that has been adopted, though we cannot quite see its application, and such a beautiful plant seems worthy of a more distinctive common name.

Wormseed.

G.R.S. (Biggenden)—

The specimen is Wormseed (*Chenopodium ambrosioides*). This is a widely-spread weed. The fruit is official in the United States Pharmacoepoeia, and the oil from it (Oil of Chenopodium) is used as an expellent of worms. As a rule, this plant is only sparsely scattered, and is occasionally eaten, but not to a very great extent. If extensively eaten, it would probably be harmful.

VETERINARY ADVICE.

Bloat in Cattle.

E.G. (Nerang)—

It would appear likely that the condition you describe in cattle following feeding with the cowpea is simply hoven or bloat, and not prussic-acid poisoning.

Bloat is treated by puncturing the most prominent part of the swelling on the left side with a trocar and canula, removing the trocar, leaving the canula in position, which allows the gas to escape. If trocar and canula are not available, stabbing with a pocket knife is effective. If the condition does not recur the animal may be given a powder consisting of Nux vomica, ½ oz.; Ammonium carbonate, ½ oz. Mix the powder with treacle and place on the back of the tongue. Give one powder night and morning until six powders have been given.

Mammitis Veterinary Advice.

E.T.G. (Baralaba)—

Mammitis may be caused by (*a*) germ infection; (*b*) injury. Of these, the first cause is by far the more serious. Usually, the udder becomes warm and hard and the milk secretion curdy, and sometimes mixed in it is a little blood.

Treatment—

1. Isolate the affected animal, milk her last, and the affected quarter or quarters last of all;
2. Care should be exercised that the hands are washed immediately after handling the affected udder;
3. Strip the udder three or four times a day;
4. Apply massage at each milking for ten minutes or a quarter of an hour each time. Camphorated oil may be used for this treatment;
5. If used in the early stages vaccines may be of value, and, should you require a vaccine, it could be obtained from the Animal Health Station, Yeerongpilly, at a small cost, provided a sample of infected milk is sent, with a covering letter.

To procure the sample, firstly clean a small bottle and boil it for ten minutes with a cork in it. After rejecting the first few squirts of milk, take a sample of the udder milk into the bottle and send it to the Animal Health Station, Yeerongpilly, by the first available mail. From this a vaccine can be made.

"Queensland Itch."

A.M. (Lawgi, near Rockhampton)—

1. The condition you refer to is known as "Queensland itch." This disease is peculiar to Queensland and is usually seasonal in nature, occurring mostly at the change of seasons—i.e., autumn and spring—although it may be seen at any time.
2. The condition is not parasitic in nature, nor is it contagious, but as the exact cause is still obscure no definite cure can be recommended.
3. Relief should be given to the horses by washing them with a solution of *potassa sulphurata* (a drug obtainable from your chemist) containing 1 oz. of *potassa sulphurata* to 1 gallon of water.
4. This wash is highly irritant to bare skin—as around the eyes, the mouth, and under the tail—and, hence, care should be exercised in washing the horses.

Rural Topics

Uses for Old Rubber Tyres.

Here are some interesting uses to which old motor tyres may be put.

One farmer has two standing permanently beside his shed. When he returns from town with heavy loading that it is unwise to bump, he rolls out a tyre and drops the article on to it from the side of his lorry. The resiliency of the tyre takes up the jar, and so makes the task of unloading quite a simple matter. Another farmer has cut a strip out of the edge of a tyre and uses it as a creep for his young pigs.

Tyres adapted to hold water are common in many poultry yards, but the idea of a farmer who, by selecting a small tyre, cutting it through at one place and threading it on to a chain, has made an excellent spring to shut a gate.

A useful suggestion is behind another farmer's thought. He cut a section from a tyre and almost buried it where a much-used farm gate usually swings when open. By forcing the gate over the tyre, he is able to retain it in an open position. By merely standing on the highest point of the tyre, it is squeezed down and the gate can be closed.

An easy way to burn out an old tree stump is to place an old motor tyre round it and set alight to it all round the circumference. The tyre, or two, if necessary, can be cut at one side so that it can be placed in position.

An attractive appearance has been lent to a New Zealand farmer's entrance drive. He has planted an herbaceous border along both sides, and has laid out wide strips beyond the border in shrubs. Right from the cattle stop gate, he has two parallel rows of old tyres painted white to tone in with similar parallel rows of white-washed stones. Each of these tyres encircles a shrub with the earth heaped toward the centre. They not only hold the earth, but prevent grass from encroaching.
—"The New Zealand Farmer Weekly."

Butter Fat Instead of Butter for Export.

The newest idea in saving export shipping space is what is called the re-separation of butter, and the New Zealand Dairy Research Institute has been experimenting successfully with this new technical process. In this re-separation the butter is dissolved to liquid by steam and then run through an ordinary cream separator, which extracts the water, casein, and other substances, leaving only the pure fat. This fat can then be packed in tins and shipped abroad without refrigeration. The extraction of the water and other things also reduces the weight of the product by about 18 per cent. This fat, which can be sent by ordinary cargo ships, can not only be turned into normal butter very easily, but can also be used in the making of margarine. That means, of course, that in its use in making up butter substitutes the dairy industry is not left out entirely.

Trees on the Farm.

On our farm lands and pastoral country trees have many valuable purposes. They can be grown as windbreaks and shelter belts; dotted round a run they provide shade and shelter for stock; they provide a reserve supply of fodder for a dry time; properly lopped, they keep the woodheap supplied; they are useful as screens round dams and tanks to prevent their silting up with dust and undue evaporation of water; they prevent erosion on slopes and along the banks of creeks and rivers, and add to the value and appearance of the farm home.

"An Apple a Day" for the Cow.

Here is something that will interest Stanthorpe apple-growers.

By tests at an agricultural experiment station in the States, it has been established that the dry matter of apples as feed for cows has about the same feeding value as that of corn silage. In New Zealand, as well as in America, dairy farmers have found the value of chopped apples in conjunction with bran as a feed for cows, especially in the late summer. The apples are put through a slicer, and, with a small quantity of bran, fed to cows immediately after milking, so as to avoid the risk of any abnormal flavour in the milk or cream. A reasonable ration is 20 lb. a day.

That is certainly one good way of making use of fruit that, under present circumstances, becomes in some times of the year a glut on the market.

Training a Sheep Dog.

A correspondent of *The New Zealand Farmer Weekly* asked in a recent issue for answers to the following questions:—

(1) In a good many cases the dog crouches when approaching the sheep: is this correct? (2) Should the dog at any time bark? (3) With defiant sheep, should the dog stand his ground or retire and let the sheep turn themselves? (4) What is the difference between long and short head?

"C.H." replied—

The reader who inquires for information on training his young dog for trials is in the position of many other enthusiasts. The young dogs show the necessary qualities for success, but these must be brought under the control of the trainer, while unsatisfactory habits must be eliminated and the more desirable qualities fully developed. To do this with the young dog just starting to work requires patience and also a definite plan of campaign. The importance of various qualities must be placed in their proper perspective.

For instance, the reader inquires whether his dog should maintain his crouching attitude in approaching sheep or not. The rights and wrongs of this method of approach are outweighed by the more important aspect of the attitude of the dog toward the sheep. Any approach that is bold is good. Naturally there is nothing bold about an approach that takes place with the dog's abdomen sliding along the ground, but a crouch denotes instant readiness for a quick movement in any direction, and is, therefore, good, providing it is accompanied with firm determination in the dog.

Dealing with the second question as to whether barking is permissible, the answer is definitely no. If one aims to enforce silence under all circumstances the amount of barking will diminish to an almost negligible quantity. Never allow the young dog to endeavour to lift "stiff" sheep by barking. Scold him immediately he barks, not so forcibly that he will turn tail and run out of range of his trainer's wrath, but sufficient to let the dog understand that barking does not meet with approval. Keep the dog stationary some distance off from the sheep for a few moments before fetching him on again. Do not allow the dog to gain the impression that there is need for hurry. It is often because the young dog is brought on too quickly that encourages barking. Personally, I prefer to allow the young dog to bite the noses of truculent sheep in any manner that offers so long as he shifts his sheep. I can always control the approach, but I could not, perhaps, teach the dog to bite later.

At this time of the year in-lamb ewes are inclined to become very difficult for a young, strong-eyed dog to lift; therefore, "schooling" is better carried out on a few hoggets or two-tooths.

The next question, as to whether a young dog should hold his ground when facing a truculent sheep, is also one that presents certain other considerations. Broadly speaking, the dog should hold his ground, but by forcing a young dog to do so the trainer would be more likely to develop fear in the dog rather than courage. It is this latter quality that enables the dog to face up to the sheep that "looks for fight." If the dog is confident that he can deal effectively with such sheep he will not give ground too easily. By working a few rams along a fence while the trainer retards their progress as much as possible by walking at their side, so as to press them on to the fence, and at the same time using a stick in between the dog and the rams, confidence can be developed. To do this the dog must not be stick-shy. If he is afraid of the stick he should be educated so that he comes to regard the stick as he does the trainer's hand. This can be achieved by continually stroking the dog with the stick and always moving the stick slowly. As the exercise of working sheep along the fence proceeds, the trainer can educate the young dog to advance at command. Should one sheep appear to be about to charge the dog the offender can be checked by using the stick. This is the best exercise I have found to develop a bold, trustworthy approach. Never expose the young dog to unreasonable danger until he is ready to deal with it and he will soon stand firm before the most truculent sheep.

Dealing with the last question, as to the difference between the long head and short head events at trials, briefly the difference is in the distance of the outrun. The long head requires the dog to pick up his sheep at about 800 yards from his handler and later holding the three sheep in a ring and driving round the ring. The short head outrun is about 440 yards, and the sheep are driven through a set of hurdles 9 feet apart, then driven along a marked course 1 chain wide to a yard 6 feet square, where the sheep are yarded without assistance to the dog. The handler is required to keep one hand on the open gate during the yarding process.—*The New Zealand Farmer Weekly.*

Grass Seeding by Airplane.

In the United States the airplane is now used as a seed planter as well as an insect duster in pest control. The Soil Conservation Service is credited with the bright idea. A lot of rough country had to be grassed, and ordinary methods of seeding were found either impracticable or too costly. With a 20-inch rainfall it was considered that a good growth of grass could be obtained and which would provide a protective cover which would be useful in preventing surface soil wash, as well as good grazing for stock. The question arose as to the best way of broadcasting grass seed over a large area, and it was decided to try seeding by aeroplane. An air-line firm took on the job, and for the purpose reconstructed the interior of a small cabin passenger plane, making room for a hopper with a capacity of 500 lb. of grass seed. Test flights were made with the hopper loaded with sawdust, to see how the idea was likely to work. Further test flights were made, using grass seed, and the seed distribution was checked on long strips of muslin. The tests proving satisfactory, actual seeding of a large area was carried out by flying at a height of 300 to 500 feet, so that the grass seed was distributed in a swathe about 100 feet wide. The flight lines used were 100 feet apart and the country was cross-seeded to ensure proper distribution. A man on the ground indicated the flight lines to the pilot, checked the distribution of the grass seed, and flag-wagged the plane from the job when the wind scattered the seed too widely. The best times for seeding were found to be from daybreak until about 10 o'clock in the morning and from about 4 o'clock in the afternoon until dusk. Altogether about 6,000 lb. of grass seed was broadcast in ten hours of flying time distributed over three days. The area seeded was just under 3,000 acres. Both distribution and germination of the grass seed were considered highly satisfactory. The cost of seeding was not too much and should be considerably less for large areas and for country not so broken. Whether adaptable to other conditions or not, or even if the method is regarded as fantastic, the tests and their practical application provided a lot of useful information and established the feasibility of adding one more peaceful and beneficial use for the airplane.

Apples not Good for Laying Hens.

Here is a good tip for the fowl yard: A woman poultry farmer tells in *The New Zealand Farmer Weekly* of her discovery that raw or cooked apple cores are *not* a good feed for fowls. This is what she says in her own words:—"My experience has been that a feed of apples will stop hens from laying if they are laying, or will delay laying if they are not already laying. The natural thing to do with a quantity of apple cores is to throw them to the fowls, but this is a mistake. On the other hand, pigs will eat apples until further orders, and there can be no doubt that apples, or parts of apples, give flavour to bacon."

Maize Values in the Dairy Ration.

Experiments at the Iowa Experiment Station show that a bushel of ground maize will be 20 to 25 per cent. more value to feed to a dairy cow than a bushel of maize in the ear, and that coarse grinding is more satisfactory than fine grinding.

Herd Testing.

As every dairy farmer knows, there is no "get-rich-quick" methods in his industry, and the only safe way is to have the best obtainable type of cow in his herd. We all realise this, hence the growing support to the herd-testing movement, which, it is computed, has in recent years doubled the profit of many dairy farmers who have tested their cows and, as a result, culled the "robbers" and the "star boarders," and so increased their milk supply at less cost.

Around the Water Trough.

Here is a point that is often observed on dairy farms, particularly on the coast during wet weather: The surroundings of water troughs frequently become a wet, muddy, unsightly source of annoyance. Not only that, but when the area around a trough is boggy the smaller cattle have a difficulty in getting to the trough, and when they do get through find it hard to get a good drink. A few loads of sand or gravel will make access easy and will soon pay for the trouble involved.

What We Owe to the Plough.

It seems sometimes that we forget what we owe to the plough and the man who works it. Many people have got so far away from natural country life that they do not appreciate their debt to the plough and the high standards set by the farmer. It is the lesson of history that civilisation of countries began to fail when their cities began to overshadow and dominate their rural life and industry.

Farm Notes

AUGUST.

AUGUST is normally a dry month throughout the State, but where good soil moisture exists the coming of warmer weather will cause an increase in weed growth, necessitating the use of cultivators in growing crops and the land being prepared for maize, cotton, sorghums, and other crops.

Well-worked land having reserves of subsoil moisture is essential for satisfactory subsequent growth, as spring-sown crops often have to withstand moderately dry conditions until the occurrence of early summer storms.

In coastal districts where frost is not liable to occur, early sowings of maize, sorghums, millets, sudan grass, pumpkins, and melons may be made. Arrowroot, artichokes, and sweet potatoes also may be planted, but unless ample soil moisture is present, there is little to be gained by very early sowings before the soil is sufficiently warm, as later-established areas will often make rapid growth, equalling or excelling that of earlier sowings.

Potato planting will be commencing in the Downs, South Burnett, and other areas away from the coast, where July plantings are likely to be affected by frost, the bulk of the spring crop being established during July and August.

Potatoes thrive in thoroughly prepared virgin soils, more especially deep, friable, well-drained alluvial loams and scrub soils, which indicates that the maintenance of a supply of humus in the soil is essential for profitable yields.

Seed potatoes for this crop are usually obtained from the Southern States, where certified seed true to varietal type is now available, but, to prevent seed-borne disease, all seed should be treated either by the hot formalin or corrosive sublimate methods, full particulars of which are obtainable from the Department. Whole sets are preferable, but cut sets may be used for the spring planting, dusting the cut surfaces with wood ashes or slaked lime shortly after cutting.

Dairy farmers in many districts will now be utilising early sown winter fodder crops to maintain production, and where crops are grazed, temporary subdivision will prove valuable in conserving growth and providing fresh pastures at frequent intervals.

On the Downs the grazing of wheat areas, intended ultimately for grain, should have ceased by late July, otherwise probable yields are likely to be considerably reduced.

LOG MEASUREMENT.

For royalty purposes, as well as for other reasons, it is sometimes necessary to estimate the number of superficial feet in a log. The following simple formula will enable this to be done.

Take one-fourth of the mean girth in inches and square it, then multiply by the length of the log in feet, and divide by 12. The mean girth is obtained either by measuring the girth in the middle of the log, or by taking the mean of the girths at both ends.

Example.—Take a log 20 feet long with a 10 feet girth at the butt end and a 6 feet girth at the other end.

The mean girth therefore is 8 feet, and one-fourth of the mean girth (in inches) is 24. Square this, multiply by the length of the log (in feet) and divide by 12.

$$\frac{24 \times 24 \times 20}{12} = 960 \text{ superficial feet.}$$

Orchard Notes

AUGUST.

THE COASTAL DISTRICTS.

(Last month's notes are repeated.)

WITH the exception of the late-ripening varieties, citrus fruits will have been harvested by now, and cultural operations should be receiving attention.

Trees showing indications of impaired vigour will require a somewhat heavy pruning, both in respect of thinning and shortening the branches. Where the trees are vigorous and healthy a light pruning only will be necessary, except in the case of the Glen Retreat mandarin. The densely growing habit of this variety leads to a profusion of weak shoots, which, if allowed to develop, will cause overbearing with resultant small and inferior fruit at an early age.

Where trees show signs of failing, look for collar rot at or near ground level. The roots should be examined for disease, and in the North Coast districts for the citrus root bark channeller. A light application of paradichlorobenzene buried a few inches deep in circular drills around the tree and with the surface stamped firmly has been recommended for controlling this pest. The distance between the circular drills should be not more than 18 inches, and care should be taken to prevent the crystals of paradichlorobenzene from coming into contact with the roots. It may be necessary to repeat the application after an interval of three or four weeks.

Where it is necessary to control brown spot of the Emperor of Canton mandarin, black spot, melanose, and scab, the fungicide should be applied at the correct time. The control measures recommended are—

For Brown Spot.

Home-made cuprous oxide mixture (3-40)—

(1) At ½ to ¾ petal fall (i.e., as soon as the majority of the fruit has set).
(2) Two months later.
(3) In late February.

For Black Spot.

Home-made cuprous oxide mixture (3-40)—

(1) At ½ to ¾ petal fall.
(2) Two months later.

For Melanose and/or Scab.

Home-made cuprous oxide mixture (3-40)—

(1) At ½ to ¾ petal fall.

Certain applications of these copper sprays may be combined with various insecticides and mixtures to correct mineral deficiencies, such as zinc. Information regarding these mixtures can be obtained from this Department.

Where for any reason healthy trees of vigorous constitution are unprofitable, they may be headed back—in fact, have the whole of the top removed—leaving a few selected arms. All other branches should be cut away at their source of origin. The three or four remaining arms, of which lengths will vary from 2 to 4 feet, will form the future framework of the tree. Care must be taken to cover the whole of the exposed bark with a suitable coating of whitewash to prevent sunburn. The numerous shoots which will grow from main arms should be suitably reduced, leaving from two to four on each arm. Under favourable conditions, these will be in a fit condition to receive selected buds from desirable trees by the following autumn. It is desirable that when shoots intended for budding have attained a length of from 6 to 9 inches, their terminals should be nipped off in order to stiffen their growth and guard against the possibility of damage by strong winds.

Fertilizing should be finished as early as possible, the mixture for the spring application being high in readily available nitrogen. Ploughing should then be completed, the depth being regulated by local conditions and the nature of the original preparation of the land. After the ploughing, the land should be worked down to a fine state of tilth. On hillside orchards, attention should be given to the control of possible storm waters. Cultivation should be so arranged as to form shallow drains or banks along the tree rows and across the heaviest slope, leading into suitable side drains which may be grassed to prevent erosion.

Planting of trees may be continued and, with the exception of custard apples, expedited. The attention of citrus growers should be confined to varieties suited to their local conditions.

Pruning of grape vines should be completed, and where cuttings for planting are required these should be selected, trimmed, and heeled-in in slightly dry soil. Canes intended for cuttings should not be allowed to lie about and dry out, but should be treated the day they are severed from the plant. Cuttings are frequently made too long. From 10 to 12 inches is a suitable length which allows for insertion in the soil so as to permit of the top bud, with a short section of the internode, protruding above the surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL pruning, other than that applied to peaches and varieties which are late in coming into growth, should be finished this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. When there are indications of the swelling of the buds, the time is opportune for working over unprofitable trees, where the stock is reasonably vigorous. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

Pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation, as they are subject to much variation.

The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted, deep working is most detrimental.

Plate 16.
MOUNT LINDESAY (SOUTH QUEENSLAND), FROM A BEND IN THE BORDER HIGHWAY.

Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

THE CARE OF THE PREMATURE BABY.

DO you know that in Queensland during 1940, 721 babies under twelve months of age died? About three-quarters of this number died before they reached the age of one month, the reason being that many of these babies were born prematurely, that is, before the full nine months of pregnancy were reached; or else, they were feeble, weakly infants who should have received the same treatment as those who were premature. If we could save even half of the premature babies who are born each year in Queensland, we should have a marked lowering of the infantile death rate. The sad part of it is that very many of these babies could be saved if only all mothers and nurses knew how to care for them or would obtain advice from someone who is competent to give it. I think most people have some sort of an idea that when a baby is premature he needs extra care, but we find that very few have any real knowledge of those most important *special points* in the care of these tiny babies. Such babies when born in a locality where there is a Maternal and Child Welfare Centre (Baby Clinic) should be at once brought under the notice of the Sister in Charge there. The sisters in our service have received specialised training in the care of premature and weakly babies and are always willing to advise the mother or to help her in the practical carrying out of the doctor's directions in the care of these cases. Where a country mother is able to have a child welfare trained nurse in her home for a time after the arrival of a very tiny baby, she is indeed fortunate, but for those mothers who cannot afford such help, and who live in districts where child welfare centres have not been established, the following directions may be helpful.

The Appearance of Prematurity.

A premature baby is always small, being under 5 lb. in weight. As well as being much smaller than a normal baby, he differs in appearance as well. The little body is very soft and limp, the skin wrinkled, downy and redder than usual. The infant is very weak and often too feeble to suck. The cry also is feeble and

suggestive of the mewing of a young kitten. Often baby cannot cry at all. All babies under 5 lb. in weight should be treated as premature.

Main Points in the Care of Prematures.

There are four main points which must receive immediate attention, if a premature baby has to have a reasonable chance of living. These are:—

(*a*) Prevention of chilling. (This is most important and must receive first consideration.)

(*b*) Careful feeding with mother's milk.

(*c*) Careful avoidance of infection.

(*d*) Avoidance of unnecessary handling.

Prevention of Chilling.

Because baby has come too soon he chills very quickly. A premature baby who has been allowed to become thoroughly chilled soon after birth rarely lives. Therefore, when we know that an infant is to be born prematurely, we should at once make every preparation to keep him warm from the very moment he comes into the world. For this purpose we prepare a small cot. In hospital this is an easy matter, but in a private house, particularly as baby is coming along before mother has everything ready, a cot may not be available. However, we need not worry about that. A very satisfactory and comfortable bed for the wee one can be very quickly improvised. Half of an old fashioned wicker dress basket does splendidly, and failing this, the family clothes basket. Even a big box or a drawer out of the duchess may be brought into service. To prepare the improvised cot first line it with either brown paper or newspaper: this is to prevent the escape of heat. After this, and for the same reason, line the inside with blanket. A strip of old blanket or a wide woollen scarf can be used. To fix this place it outside the basket so that it reaches from top edge to bottom and fasten it securely either with a string tied round the top or by sewing through the basket and blanket at intervals. Having done this turn the blanket over inside the basket so that it is completely lined and also has a tidy top edge. Then throw a single blanket lengthways over the basket so that it does not reach quite to the head. Place a firm pillow in the bottom and a soft one over it to form a mattress. A flannelette napkin will serve as a sheet and a small folded fine soft towel as a pillow. At first a mackintosh will not be necessary, but later it should be provided. Place hot bottles in this specially-prepared cot and keep it well warmed until baby arrives. As soon as he is born baby should be wrapped in warmed cotton wool or soft flannel and placed in this cosy well-warmed cot and kept there until he is thoroughly warmed. He should not be moved for at least eight hours. Premature babies are never bathed in the ordinary way, but when baby is thoroughly warmed he may be cleansed with a little warm olive oil, using cotton wool swabs. Do not take him out of his cot to do this, and carry it out as quickly as possible, uncovering only one portion of his body at a time (say, one arm or one leg). Take care not to move or handle baby any more than you can help. The cot should be in a warm place and screened from draughts while this is being done. A premature baby chills so easily that he needs more warmth in the cot than is provided by the bedclothes. This should be supplied by hot water bags or bottles. Rubber bags are best, but if they are not available, some ginger beer bottles or ink bottles will serve. In cold weather three are required, one at the foot and one at each side. The bag at the foot of the bed is placed between the two pillows, the side ones lie, not against baby's body, but well tucked down at the side between the enveloping blanket and the mattress. See that the necks of the bottles are pointing towards the foot of the cot. This is important in case any leakage occurs. For the bottle at the foot use two-thirds boiling water and one-third cold water. For those at the side use equal parts boiling and cold water. These require to be refilled one every hour in rotation during cold weather. In warm weather two bags are usually sufficient once baby is thoroughly warm and they do not need changing so often. Although baby needs to be kept warm you must not deprive him of fresh air. In our Queensland climate the air, even in winter, is not cold enough to hurt the premature baby provided his bed is kept properly warm, and in the hot parts of the State, and in very hot summer weather, you must guard against over-heating. If you can obtain a dairy thermometer you can keep it inside the bedclothes, and it should register between 85 and 95 degrees Fahrenheit. As baby's strength improves gradually decrease the artificial heat. Oil him every second day, taking the same precautions as for the first oiling. Do not bath him until he weighs at least 5 lb. without his clothes, and if the weather is very cold he may safely be left longer. Commence by sponging the face and hands and gradually increase until he is being fully sponged and later bathed.

Feeding.

Feeding this tiny baby is the second important point, and if it can possibly be obtained, he should have mother's milk. We all know that the normal, healthy baby thrives best when fed on his own mother's milk, so for the premature it is even more necessary; in fact, few premature babies thrive without it. You can easily realise that the digestive organs of this tiny infant are not educated up to the demands of independent life, and only the most easily digested food like mother's milk can be tolerated, and even this has sometimes to be diluted at first. Failing his own mother's milk, the milk of another healthy mother is the next best thing. Sometimes a relation or friend who has a healthy baby of her own is able to act as foster mother. It does not matter if the foster mother's baby is some months old; the milk will not hurt the premature baby on that account, although it is advisable to dilute it at first and also to boil it before giving it to the baby. If only a small amount of milk is available either from baby's own mother or the foster mother, it will be necessary at first to make up to the full requirement with whey or—where fresh cow's or goat's milk is not procurable—with weak condensed milk mixture. It is most important to begin with a weak mixture, because the consequences of commencing the feeding of a premature baby with too strong a mixture may be serious. It is advisable, however, where either a part or complete artificial feeding has to be given, to seek the advice of the Child Welfare Sister, either personally or by letter, as a premature is so very easily upset by wrong feeding. Nothing but warm boiled water should be given to baby for the first twelve hours of his life, but after that he must have food. It is impossible to say how much baby should have at a feed. Some very tiny, feeble babies are quite unable to suck and almost unable to swallow. Such cases must be fed from a pipette or eye dropper with about 2 inches of soft rubber tubing on the end. If baby is only able to take very little—say, one or two teapsoons at a feed—he must be fed every hour with one three-hourly interval at night. As he takes more the time between the feeds is gradually lengthened (by a quarter of an hour at a time) to two hours and then later to three hours. As soon as he shows signs of attempting to suck, a small feeding bottle with a soft teat may replace the eye dropper. Do not lift baby from his cot to feed him until he weighs 5 lb. The milk should be expressed for him and fed from dropper or bottle. When he weighs 5 lb. he may be put to the mother's breast, but only for a minute or two as he becomes easily tired and is liable not to suck sufficient. The remainder of his feed is expressed either by hand or breast pump and fed to him with his bottle. Every effort must be made to maintain and increase the mother's milk supply.

Prevention of Infection.

The third important point in the care of the premature baby is to prevent his becoming infected with any illness such as a cold, influenza, &c. Because he is weak and undeveloped baby is very susceptible to infection and even a common cold in an attendant or visitor can easily lead to a fatal pneumonia in a premature baby. You will find that all your friends and neighbours will want to come along and look at baby because he is so tiny. However hard it may seem, you will have to tell them gently but firmly that baby must not have visitors until he is stronger. It is better to risk offending these people than to risk your baby's life. If mother or nurse develops a cold and cannot be relieved from the care of baby she should tie a pad of from four to five thicknesses of butter muslin over her nose and mouth while attending to him.

Avoidance of Handling.

This fourth important point, although we have left it till the last, is one which needs to be very carefully observed. Handling is very harmful to the feeble premature baby, and is often the cause of attacks of asphyxia. Until he shows signs of increasing strength, he should not be lifted from his cot while he is fed or oiled, and he should be handled as little as possible when he is changed. Some alteration of position is necessary however, and he should be gently turned from one side to the other twice or three times a day.

Result of Care.

The care of a premature baby calls for not only a great deal of trouble, care, and patience, but a high degree of skill. We know of many babies weighing as little as 2 or 3 lb. at birth, who, under skilled care, have lived and developed into strong, healthy children. The successful rearing of such an infant is justly a source of pride to mother and nurse.

You can obtain further advice on this or any other matter relating to the feeding and management of children up to school age by writing to "Baby Clinic, Brisbane." Such letters need not be stamped.

IN THE FARM GARDEN.

TRANSPLANTING SHRUBS.

DR. D. A. HERBERT.

WITH the coming of wintry weather, many of our trees and shrubs passed into a state of comparative rest. It is in their dormant or semi-dormant condition that they can be most safely transplanted, so this is the important season for planting out new trees and shrubs, or for moving them round from one part of the garden to the other. Many a garden would be improved by a rearrangement of the larger and more permanent plants. Roses, for example, on the south or shady side of the house often suffer from mildew, but if shifted to a sunnier position are comparatively free from the disease, especially if at the time of transplantation a liberal quantity of wood ash is worked into the soil. The only limits on transplantation of most shrubs and trees are imposed by their size. If they can be lifted with a good ball of earth round the roots they generally take up a new position without much trouble, but, of, course, the labour involved in moving a large tree is usually too great for the home gardener. When a large shrub, such as a hibiscus, is to be transferred to another site a trench is dug round it about 18 inches from the trunk and a foot or so deep. The circular cake of earth contains most of the important roots, but many have to be cut; consequently, some pruning back of the top is necessary to balance the depleted root system. The amount of pruning depends on the amount of root that has been removed. The plant is then lifted with as little disturbance to the remaining soil as possible and placed on a bag for removal to the new position. The bag is wrapped round to prevent the shaking off of the earth, and it need not be removed when the shrub is put into the hole. It will rot in a short time.

Shrubs and trees bought from the nursery are either balled or in pots. Those in pots frequently have their roots coiled round. It is a mistake to try to straighten these out; they have grown in that position within the confines of the pot and any attempt to spread them out will probably result in cracking them. One thing to remember in planting out these or any other plants is to press the soil firmly round the roots. One of the commonest causes of failure in transplantation is too much gentleness in pressing the earth down. The slogan should be, ''Put in the boot!'' Looseness round the roots induces drying out just where moisture is essential. A good watering after planting is beneficial, not only because of the water supplied, but because it settles the soil into position and fills up those crevices round the roots.

Many plants exposed for sale are marked ''grafted varieties.'' The term in itself does not imply any guarantee of quality unless the actual variety is specified. It simply means that the stem of one variety has been surgically united with the root of another. You could graft a bush lemon on a Lisbon lemon root; it would be a grafted plant, but you would get only bush lemons from it. Grafting is a simple operation, but involves a certain amount of time and care; so that any plant sold as a grafted variety may reasonably be expected to be a good variety grafted on a hardy root. Many plants grown from seed are of indifferent quality, and the operation of grafting transforms them into good types, by reason of the fact that good varieties are chosen to graft on as tops or scions. Budding is a type of grafting and most roses are budded. Lemons, oranges, and other citrus should be obtained as budded or grafted plants, and so should custard apples. Queensland nuts are now being budded and good varieties with large nuts are available. Where it is intended to raise a tree or shrub that may last a lifetime in the garden, it is a mistake to keep an indifferent seedling when a good quality plant can be obtained at very little cost. Of course, there is no need to look for grafted varieties of shrubs which strike readily from cuttings and are perfectly hardy on their own roots—as is the case with hibiscus, lagerstroemia, croton, acalypha, hydrangea, and a host of others—but when plants are offered with this label, they can generally be assumed to be of some special merit.

IN THE FARM KITCHEN.

STEAMED PUDDINGS.

Steamed Chocolate Pudding.

Dissolve 2 oz. plain chocolate in 1 tablespoon milk by heating it over boiling water. Beat until smooth and allow to cool. Cream 4 oz. butter and 4 oz. sugar until almost white and very light; add 2 eggs, one at a time, then 5 oz. plain flour sifted with 1 level teaspoon baking powder. Add a tablespoon flour at a time and beat mixture well after each is added. Now add chocolate mixture and a few drops vanilla essence. Mix well without beating too much. Steam in a well-greased basin and cover with greased paper for 2 hours. Serve with chocolate or any sweet sauce.

Apple Batter Pudding.

Cream 1½ oz. butter with 1½ oz. sugar until light. Beat 2 eggs well and add half of it to butter mixture, then 1 oz. plain flour and a good pinch of salt. Now add the remaining egg and another ounce of flour and the grated rind of ½ lemon. Gradually add a little more than ½ pint milk (if eggs are large, use ¾ pint) and allow batter to stand for 1 hour. In the meantime, peel and chop 2 large apples into dice and fry them in a little butter until very hot, but not quite cooked. Place them in a well-greased flat fire-proof dish, sprinkle over a little sugar and ground cinnamon to taste, then pour over batter. Bake in a hot oven for about 45 minutes or until batter is set.

Steamed Lemon Pudding.

Line a pudding basin with a shortcrust, not too rich, and reserve enough for covering top. Mix 1½ oz. cornflour with a little cold water, then pour on ½ pint boiling water, stir for a few minutes, then place in a saucepan over a low gas and stir until mixture is clear. Add 6 oz. sugar, the juice of 2 lemons, and the grated rind and the yolks of 3 large eggs. Pour this into lined basin, cover with remaining pastry. Cover with greased paper and steam very gently for 45 minutes. Turn out carefully, or it may be steamed in a soufflé dish and served in the same dish instead of turning it out.

Steamed Date Pudding.

Butter a pudding basin and line it with stoned dates, pressing them well on to sides of basin. Cream 4 oz. butter with 4 oz. sugar until light and white. Sift 6 oz. plain flour with 1 level teaspoon baking powder and a good pinch of salt. Add 1 unbeaten egg to butter, beat well, then add a little of the flour. Add another egg and beat that well in. Add about 1 dozen chopped dates to remaining flour and add to butter mixture. Lastly, add a little milk to form a dough that will drop from the spoon easily. Put mixture into lined basin, cover with buttered paper, and steam for 2 hours. Turn out carefully and serve with sweet sauce.

Baked Sultana Rolls.

Sift 2 cups plain flour with ½ level teaspoon salt, 4 level teaspoons baking powder, add 2 level tablespoons sugar, then rub in 3 level tablespoons butter. Form into a dough with 1 beaten egg and ½ cup milk. Roll out to about ¼ inch thick. Spread with a little butter, 2 cups sultanas, the grated rind of 1 lemon, 1 level teaspoon ground cinnamon, and 2 tablespoons brown sugar. Roll up like a Swiss roll and cut into slices about 2 inches thick. Boil 1½ cups sugar with 2 cups water for 5 minutes, then turn into large flat oven-proof dish. Place the rolls cut side down in the syrup, sprinkle tops with a little more sugar and place a small dot of butter on top of each roll. Bake in a moderate oven for 45 minutes or until a nice golden brown and cooked through.

Steamed Wholemeal and Honey Pudding.

Pour 1 cup hot water over 2 cups fine white breadcrumbs (or wholemeal). Allow to soak for a few minutes, then add ½ cup finely-chopped suet, 1 cup sultanas, 1 cup wholemeal flour, ½ cup honey, 1 well-beaten egg, a little grated nutmeg, ground cinnamon, and a little mixed spice if liked. Dissolve ½ teaspoon bicarbonate of soda in 1 tablespoon hot water and add to mixture. Beat well together and steam in a well-greased mould for 3 hours. A little sugar may be added if needed a little sweeter. Before serving, stud with blanched whole almonds.

Surprise Fritters.

Mash 3 bananas well and mix with 1 tablespoon stiff apricot jam, a little desiccated coconut, and enough fine white breadcrumbs to bind mixture together. Divide mixture into equal portions and flatten out a little. Roll out ½ lb. puff or short pastry and cut into large rounds about 3 inches in diameter, then roll out lightly into an oval shape. Place a portion of the mixture on each pastry, fold over and pinch edges together. Roll in egg and breadcrumbs and fry in boiling lard or good dripping until a golden brown. Drain well and serve piping hot.

Baked Banana Sponge.

Sift 1 level cup plain flour with 2 level teaspoons baking powder, a good pinch of salt, then add 2 level tablespoons sugar. Melt 1 dessertspoon butter in a saucepan, remove from gas, and add ¾ cup milk and 1 well-beaten egg. Mix well into a batter and place in a well-greased shallow dish. Peel and cut 4 or 5 bananas into halves and press them into the batter. Sprinkle with castor sugar mixed with a little grated lemon rind. Dot with a little butter and bake in a moderate oven for 20 minutes.

OTHER DISHES.

Eggs Au Gratin.

Boil 4 eggs hard, then remove shell and cut in halves lengthwise. Pound the yolks fine and add 4 tablespoons grated cheese, 2 heaped tablespoons fine white breadcrumbs, pepper and salt to taste, and if liked a little grated nutmeg. Add just enough white sauce to bind mixture together, then fill the white, forming the mixture into an oval shape. Arrange eggs in a well-greased fireproof dish, pour over about 2 cups cheese-flavoured white sauce, sprinkle over breadcrumbs mixed with some finely grated cheese. Dot with butter and bake in a hot oven until nicely browned.

Apple Shortcake.

Melt 1 level tablespoon butter in a saucepan, add 2 tablespoons sugar and stir over a low gas until melted. Add 4 peeled, cored, and sliced apples and cook for a few minutes. Add a little cinnamon, and if liked 3 or 4 cloves. Place them in a shallow fireproof dish and cover with the following:—Cream 4 oz. butter with 1 tablespoon castor sugar until light and creamy; now add 5 oz. plain flour and beat for a few minutes. Place in small spoonfuls on top of apple, sprinkle with icing sugar, and bake in a moderate oven for about half an hour. Serve hot or cold.

Fried Sandwich.

Cut white or brown bread into slices, not too thin, and butter both sides. Put some good tasty cheese through a mincer, also some crisp celery. Place a dish under mincer to catch any juice that may be extracted from celery and add it to cheese mixture with about 1 teaspoon onion juice. Add pepper and salt to taste and a little mustard. Mix well together and spread thickly on bread and join three slices together. Fry slowly in a little butter until a nice brown on both sides.

Potato Cakes and Bacon.

Sift 4 oz. plain flour with pepper and salt to taste. Rub in 2 oz. butter or good dripping. Add 8 oz. well mashed cold potato and enough milk to form a stiff paste. Roll out and stamp in rounds and fry in hot fat until a golden brown. Serve with grilled bacon.

Cream of Tomato Soup.

Wash 1½ lb. tomatoes and cut up roughly. Put in a saucepan with 1 blade of whole mace, 2 cloves, a small minced onion, and 2 bay leaves, salt and pepper to taste, and a pinch of bicarbonate of soda. Cook gently until tender, remove bay leaves, &c., and rub through a fine sieve. Melt 2 dessertspoons butter in a saucepan, add 1 tablespoon plain flour, cook a little, then add 2 pints warm milk. Stir until it thickens and then allow to simmer for 5 minutes. Now add puree and carefully reheat. A little sugar may be added, also a little cream. On no account allow the soup to boil or the soup will curdle.

Apple Butterscotch Pudding.

Crush 3 oz. butterscotch finely and put aside. Peel and slice 4 or 5 apples thinly, place them in a basin and sprinkle over 1 tablespoon sugar, the grated rind of 1 lemon, and ½ orange. Melt 2 level tablespoons butter in a saucepan, add 2 cups fine white soft breadcrumbs. Stir well over fire until butter is absorbed. Place half of the crumbs in the bottom of a well-greased fireproof dish, cover crumbs with a quarter of the apples. Mix together ¼ cup sugar, ½ level teaspoon grated nutmeg, ½ level teaspoon ground cinnamon, and sprinkle half of it over the apple. Now add half of the remaining crumbs, then another layer of apples, &c. Pour over the lemon and orange juice, then cover with remaining crumbs. Cover with a tight-fitting lid and bake about 45 minutes in moderate oven. Remove lid and sprinkle with crushed butterscotch and place in a hot oven until brown and butterscotch is melted. Serve hot or cold.

ASTRONOMICAL DATA FOR QUEENSLAND

JULY, 1941.

By A. K. CHAPMAN, F.R.A.S.

SUN AND MOON. AT WARWICK.

Aug.	SUN.		MOON.	
	Rises.	Sets.	Rises.	Sets.
	a.m.	p.m.	a.m.	a.m.
1	6.33	5.23	11.54	12.18
			p.m.	
2	6.33	5.24	12.43	1.21
3	6.33	5.24	1.36	2.23
4	6.32	5.24	2.32	3.24
5	6.31	5.25	3.31	4.21
6	6.31	5.26	4.31	5.14
7	6.30	5.26	5.30	6.4
8	6.29	5.26	6.29	6.49
9	6.28	5.27	7.25	7.30
10	6.27	5.28	8.20	8.9
11	6.27	5.28	9.13	8.45
12	6.26	5.29	10.5	9.20
13	6.25	5.29	10.57	9.56
14	6.24	5.29	11.48	10.33
15	6.23	5.30	nil	11.12
			a.m.	
16	6.22	5.31	12.39	11.52
				p.m.
17	6.21	5.32	1.30	12.36
18	6.20	5.32	2.21	1.23
19	6.19	5.32	3.11	2.14
20	6.18	5.33	3.59	3.8
21	6.17	5.33	4.47	4.4
22	6.16	5.34	5.32	5.3
23	6.16	5.34	6.16	6.3
24	6.15	5.34	6.58	7.5
25	6.14	5.34	7.40	8.7
26	6.13	5.35	8.23	9.9
27	6.12	5.36	9.7	10.11
28	6.11	5.36	9.52	11.15
29	6.10	5.37	10.41	nil
				a.m.
30	6.8	5.37	11.32	12.17
			p.m.	
31	6.7	5.38	12·26	1.17

Phases of the Moon.

7 August, Full Moon, 3.38 p.m.
15 ,, Last Quarter, 11.40 a.m.
23 ,, New Moon, 4.34 a.m.
30 ,, First Quarter, 12.4 a.m.

THE GREAT POWER STATION.

LAST month we were at our farthest from the sun, that vast globe of brilliant light, the magnitude of which we do not realise, because we are so accustomed to its apparent size at a distance of about 93,000,000 miles. The sun must be enormous to be seen at all at such a distance—a distance which would take a wireless wave eight minutes to traverse, or a plane, flying 160 miles per hour, 66 years. This mighty globe is so stupendous that were 1,300,000 earths rolled together into one huge ball, the resulting globe would only then equal the sun in size. To use a more homely comparison—if a football represented the sun, a small-sized shot would be large enough to represent the earth. The temperature at the sun's surface is known fairly accurately to be about 10,000 degrees Fahr.; this means that every square foot of the solar surface is continually radiating about 1,350 horse-power. A small fraction of the sun's surface, therefore, would give sufficient horse-power to energise all the machinery of the world. The function of the sun, however, is not to drive machinery, but to control and energise eight great worlds and the whole far flung solar system over which he holds unchallenged lordship. Yet the sun, which in every way is tremendous to us, almost beyond our conception, is but a very medium-sized star; one of a hundred thousand million, which is the number of suns estimated by astronomers to make up our galaxy of stars, a few only of which we see in our night skies.

EVERLASTING MIDDAY.

The nearest world to this stupendous power station is Mercury, a little world only 3,000 miles in diameter. As its average distance from the sun is but 36,000,000 miles, the sun's attraction is great. Perhaps it once spun rapidly on its axis, giving the little world day and night, but the action of the sun gradually caused its rotation to slow down till at length it rotated only once in one revolution round the sun, like our moon which rotates once in one revolution round the earth; Therefore, on Mercury, there must be a perpetual midday, on one side of blinding light and blistering heat; on the other hemisphere perpetual night and intense cold would reign for ever.

Towards the end of last month Mercury was visible as a morning star, but this month it will be too near the sun to be seen. On 19th August it will be almost behind the sun.

Another 31,000,000 miles brings us to the orbit of Venus. Venus is now the evening star, setting about 7.20 o'clock. On 18th August Venus will appear a little south, but quite near the distant planet Neptune. A telescope will be necessary to see this remote member of the sun's family, which appears about as bright as a mag. 8 star. On 25th August, about 6 o'clock, Venus will be very near and a little south of the slender crescent moon. They will keep together until moon-set, which will be soon after 8 p.m.

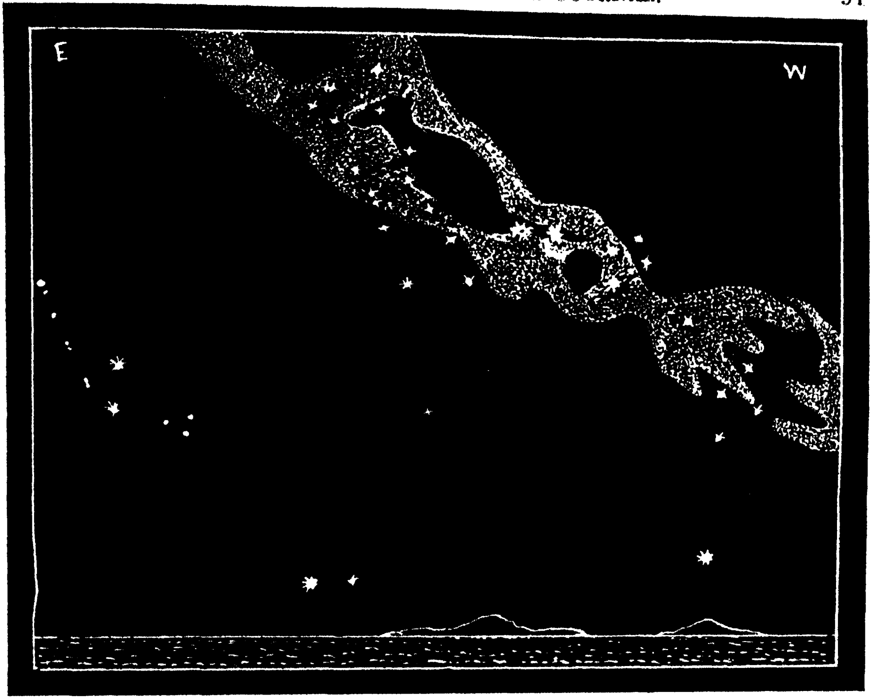
Mars rises now at 10.17 p.m. among the small stars of Pisces. It may be seen not far from the moon on 12th August.

Jupiter and Saturn are morning stars. Saturn rises about half-past 1 o'clock not far from the Pleiades, while Jupiter rises 86 minutes later.

AUGUST METEORS.

In August quite a number of meteors are often seen in the early morning. They are most numerous from 10th to 12th August, although some may be seen before and after that period. They come from a radiant in the northern constellation of Perseus, which is north of the Pleiades and are, therefore, called the Perseids. Some years they appear in greater abundance than other years. It was shown, many years ago, that these meteors moved in the same orbit as Tuttle's comet, which was discovered in 1862. There are strong reasons to believe that the August meteors are fragments of this comet, which are continuing to traverse the path of the parent body. In August of each year the earth passes through this invisible stream, and many fragments are swept up by the earth and consumed by its atmosphere.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.



LOOKING SOUTH IN AUGUST.

Many of the stars of the southern sky are circumpolar; they circle the South Celestial Pole and never set. There is no bright star at this pole; its position is marked in the picture by a small cross. Around this dark point the whole heavens appear to circle every twenty-four hours. It is the rotating earth which causes the stars to have this apparent circular movement.

On clear, moonless nights the Milky Way is most conspicuous. It has no distinct outline, but in many places there are long dark rifts and black patches. These are due to dark nebulæ—immense clouds of cosmic dust obscuring the stars beyond. Of late years astronomers have given much study to the Milky Way. They consider that the hundred thousand million stars which make up our galaxy are confined within an enormous, flat lens-shape. If we are somewhere near the centre of this lens and look towards the edge or circumference we should see an immense number of stars, but at right angles to the edge we should see few.

WHAT IS THE MILKY WAY?

When looking at the Milky Way, we are looking towards the edge of the great star-filled lens.

In the March Journal the April southern sky was shown; then the Southern Cross was as far on the eastern side of the South Pole as it is now on the western. This shows how far the Cross moves in four months in its annual journey round the Pole, or besides its daily revolution round the Pole the Cross has an annual motion. It is once only in the year that the Cross is exactly upright above the Pole at midnight.

In the March Journal it was mentioned that some tribes of Australian blacks pictured a large black Emu in the Milky Way. This is quite conspicuous when found. The Coal-sack, the pear-shaped black patch near the Southern Cross, represents the emu's head. A long, narrow, black rift running down near the two "Pointers" is the neck, which farther down opens out to form the breast and body of the giant bird.

From Ipwich way a reader says he was very interested to find the Blackfellow's Emu, which was something new to him. He very kindly pointed out the figure of a feeding kangaroo, which was quite new to me. The head of the 'roo is where the tail of the emu should be; the body is common to bird and beast, but the long neck of the emu becomes the tail of the 'roo. There is even a little black rift to mark the small forelegs of the marsupial. I must confess that the head and forepart is not very clear to me, but given imagination, good eyesight, and no city lights this figure may very well be seen.

The Cross points nearly across the Pole to the bright star Achernar, which is now rising near the south-east horizon. About halfway along a line drawn from this star to Beta Centauri, the "Pointer" nearest the Cross, is very near the South Celestial Pole. That "Pointer" is a tremendously hot and brilliant sun. The "Pointer" farthest from the Cross is Alpha Centauri—the nearest bright star to the earth, however, it is about 26 billion miles away; Beta Centauri is more than twenty times farther! Below Alpha Centauri are two fainter stars near the edge of the Milky Way which, with another farther out, forms the Southern Triangle. The three stars, with Alpha Centauri, form a diamond shape. At the eastern edge of the picture is Grus, the Crane. The two bright stars form the uplifted wings, while a long line of small stars outlines the outstretched neck; behind the wings the tail is formed by three small stars. Near the south-west corner is the lone, brilliant star Canopus, of the Ship Argo. This is the second brightest star in the sky, now getting low towards its setting, while Achernar, farther to the east, is rising.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1941 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records	May, 1941.	May, 1940.
North Coast.	In.		In.	In.
Atherton	2·28	40	4·62	3·56
Cairns	4·43	59	7·33	2·83
Cardwell ..	3·58	69	7·06	3·44
Cooktown ..	2·74	65	4·75	0·99
Herberton ..	1·72	55	2·11	2·35
Ingham	3·70	49	5·98	4·00
Innisfail	12·29	60	22·77	7·51
Mossman Mill ..	3·62	28	4·36	2·28
Townsville ..	0·92	24	2·39	0·16
Central Coast.				
Ayr	1·05	54	3·35	0·28
Bowen	1·25	70	3·88	0·79
Charters Towers ..	0·75	59	2·68	0·29
Mackay P.O. ..	3·79	70	15·53	2·05
Mackay Sugar Experiment Station	3·35	44	4·31	1·18
Proserpine ..	4·17	38	7·76	2·82
St. Lawrence ..	0·54	70	2·41	0·34
South Coast.				
Biggenden ..	1·73	42	4·44	0·41
Bundaberg ..	2·57	58	6·21	0·63
Brisbane ..	2·80	89	3·23	0·71
Caboolture ..	3·27	65	4·96	1·37
Childers	2·10	46	5·08	0·19
Crohamhurst ..	5·00	48	9·96	2·21
Esk	2·02	54	1·66	1·32

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records	May, 1941.	May, 1940.
South Coast—contd.	In.		In.	In.
Gatton College ..	1·56	42	0·93	0·86
Gayndah	1·55	70	1·74	0·61
Gympie	2·80	71	12·14	1·20
Kilkivan	1·81	60	4·34	1·35
Maryborough ..	2·97	70	7·07	1·32
Nambour ..	5·05	45	10·69	3·18
Nanango	1·53	59	2·09	1·78
Rockhampton ..	1·58	70	1·99	0·31
Woodford ..	2·98	54	5·39	0·90
Central Highlands.				
Clermont ..	1·28	70	2·10	0·27
Gindie	0·89	42	..	Nil
Springsure ..	1·22	72	1·37	0·58
Darling Downs.				
Dalby	1·29	71	0·68	2·80
Emu Vale ..	1·12	45	1·38	0·76
Hermitage ..	1·35	35	..	Nil
Jimbour	1·22	62	0·35	3·79
Miles	1·49	56	1·28	0·72
Stanthorpe ..	1·76	68	1·66	0·55
Toowoomba ..	2·16	69	1·13	1·74
Warwick ..	1·49	76	1·18	0·97
Maranoa.				
Bungeworgoral ..	0·95	27	1·78	0·62
Roma	1·42	67	1·56	0·65

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MAY, 1941.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points	
Cooktown	..	80	70	82	7, 17	60	27	475	23
Herberton	..	69	58	75	9	45	31	211	24
Rockhampton	30·12	77	61	82	10, 24	50	1	199	8
Brisbane	30·21	73	56	80	2	51	17	323	9
Darling Downs.									
Dalby	..	73	47	79	1	37	15	68	4
Stanthorpe	..	66	40	75	1	27·3	17	166	7
Toowoomba	66	66	50	75	1, 2	38	25	113	7
Mid-Interior.									
Georgetown	30·00	86	62	92	8, 9, 10	51	31	46	1
Longreach	30·12	79	53	84	2, 23	42	27	75	3
Mitchell	30·20	72	45	80	3	31	16	186	6
Western.									
Burketown	..	86	64	92	8, 9	55	26, 30, 31	42	2
Boulia	30·07	79	52	86	18, 23	40	1	Nil	..
Thargomindah ..	30.20	74	50	83	23	39	26, 27	24	3

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies **Five Shillings,** including postage General Public, **Ten Shillings,** including postage

Vol. LVI. 1 AUGUST, 1941 Part 2

Event and Comment

Change from Butter to Cheese.

LIKE every other industry producing for export, the dairy industry is faced with a grave situation, but the proposed change-over from butter to cheese production will go a long way towards ensuring stability in present difficult circumstances

Conditions brought about by the war constitute a challenge to dairy farmers and manufacturers alike It is believed that one important outcome of the acceptance of this challenge will be the attainment of higher technical standards in dairy production The need for turning out choicest quality cheese, as the obligatory transition in manufacture proceeds, is recognised by the dairy industry as imperative If all concerned accept the principle on which the proposed swing-over is based and concentrate on the production of cheese of the highest quality attainable, it is believed that many practical and lasting benefits will certainly accrue to the dairy industry as a whole.

What is necessary at the present time is to preserve the basic structure of the land industries, so that when the occasion arises they may be able to change back to normal production and soon afterwards to increased production at even higher standards of efficiency.

In butter quality Queensland has built up a great reputation, and with our capacity for dairy production, almost boundless in its scope, both quality and volume are assured in ordinary circumstances. In annual value, our butter production alone has attained a peak of £10,000,000 in round figures, so the prospective swing-over from butter to cheesemaking in certain districts, the Darling Downs particularly, has not been lightly considered. Only the stern necessities of war have forced the change upon us.

Britain will take from us at least 40,000 tons of cheese in 1941-42—more than four times the volume of our shipments last year. Of that quantity, Queensland is asked to produce 20,000 tons for export, four times as much as we sent overseas during the same period.

As to butter, under the new agreement Britain will take about 60 per cent. of Australia's exportable surplus, which approximates 100,000 tons a year; and of that proportion only choicest and first-grade butter will be acceptable.

Under the dairy produce contract between Great Britain and the Commonwealth for 1941-42 the price for choicest and first-grade cheese has been fixed at 83s. 9d. per cwt. f.o.b., compared with 76s. 6¾d. for 1940-41. For second-grade cheese the price will be 81s. 3d., compared with last year's price of 74s. 0¾d. For third grade the price is 78s. 9d., compared with 71s. 6d.

The increased price is an inducement to suppliers to facilitate the change to cheese. Such a change cannot, admittedly, be made easily. There are obvious difficulties to overcome, but they are not insuperable. The plain fact is that butter producers are faced with the alternative of either reducing their output substantially or placing their surplus in cold storage for an indefinite and probably protracted period. A final quittance of stored butter may even be out of the question, if present war conditions continue or become worse. A substantial reduction has been forced on the industry, and this decrease can be balanced by a substantial increase in cheese output without financial disadvantage to the dairy farmer.

As for additional equipment required in the swing-over, inquiries show that ample material is available for all requirements of handling and manufacture.

A survey also has revealed that no other State is so well equipped as Queensland for a diversion from butter to cheese manufacture.

Already the diversion from butter to cheese is proceeding satisfactorily on the Darling Downs, although for many dairy farmers it means changing an established routine. However, in spite of transport difficulties and other inconveniences, the farmers involved are facing the altered situation—and the extra work—in a very fine spirit while realising, of course, the compelling force of circumstance.

The immediate necessity is to fill every available vat in every factory, so that our present cheese out-turn may be quadrupled. With existing manufacturing facilities last year's output can be doubled; by increasing factory equipment 5,000 tons more can be added; and by extending factory accommodation cheese production can be brought up to 20,000 tons, and that is the present objective.

Dairy Production—Disposal of Surplus.

ON their return from a meeting in Melbourne of the Commonwealth Dairy Produce Control Committee, the Queensland representatives, Messrs. T. F. Plunkett, M.L.A. (chairman), and Chris. Sheehy, stated that the committee had reached a number of important decisions in regard to the disposal of surplus butter and cheese to be produced in the season 1941-42. The British decision to take a greatly increased quantity of cheese while very substantially reducing butter purchases necessitated a large change-over from butter to cheese. Every ton of butter by which the unsold surplus was reduced must improve the position of the butter suppliers. Action in the direction of a change-over from butter to cheese had already been taken by the committee. A survey had been made of the possibilities of increases in cheese production in each of the States, and thanks to the active co-operation and assistance of the Minister for Agriculture and Stock (Mr. F. W. Bulcock) and his officers, the matter had progressed to quite a considerable extent in Queensland.

To achieve a maximum change-over, however, it had been recognised by all concerned that manufacturers and suppliers meeting the position must be assured of equitable treatment, and arrangements had now been completed to that end. Features of such arrangements in the case of manufacturers were:—(*a*) Loans to factories through usual channels on the guarantee, where necessary, of the Commonwealth Government. (*b*) Assurance to be given by the industry, through the Dairy Produce Control Committee, that manufacturers will be guaranteed against individual loss in meeting the change-over by having extensions and/or additional plant provided by them taken over by the committee on a basis of cost, less depreciation in the event of a slump occurring during the war or within a period of two years following the termination thereof; a fund to be provided by way of charge on contract butter for the year 1941-42 to the end indicated. (*c*) Expenditure in respect of which a guarantee was required from the committee must receive the prior approval thereof. (*d*) The committee to seek the further co-operation and assistance of State Ministers for Agriculture by having them associate themselves with State committees to be created for the purpose of advising on loans for purposes of the change-over. (*e*) The committee in dealing with loans to have full regard to the principle of keeping down capital expenditure by making the fullest use of existing manufactories and equipment and generally of confining expenditure to manufactories best suited economically for the purpose.

In the matter of equitable treatment of producers, relative values returned for butter and cheese would be carefully watched by the committee.

Discussing the question of second-grade and pastry butter, Messrs. Plunkett and Sheehy intimated that it was definite that these butters would not be accepted in the contract for the season 1941-42. A quantity of this butter was now marketed within the Commonwealth, mainly for culinary and manufacturing purposes. Manufacturers throughout the Commonwealth should make every endeavour without delay to reduce the output of these butters.

Poultry Farming in Queensland.

(*Continued from page 56, July, 1941.*)

THE AUSTRALORP.

Queensland Standard as adopted by the Australorp Society, the National Utility Poultry Breeders' Association (Queensland Branch), and the United Poultry Club of Queensland.

Head.—Medium in size; skull fine with no fullness over the eyes; beak of medium length, strong and slightly curved; colour black: 5 points.

Eyes.—Full, prominent and expressive, dark-brown iris, the darker the better: 5 points.

Comb, Wattles, and Lobes.—Medium size, smooth and fine in texture; bright red in colour; comb erect, evenly serrated, and following the curve of the head; wattles neatly rounded; lobes well developed: 5 points.

Face.—Bright red, fine, not sunken, and as free from feathering and wrinkles as possible: 5 points.

Neck.—Medium length; slightly curved, and profusely feathered.

Body, Skin, and Abdomen.—Body deep, broad-backed, and of good length, breast of medium depth, broad and nicely rounded, keel straight, and of moderate length, the whole giving a well-balanced appearance; wings well formed and carried close to body; skin, white texture of finest quality. The abdomen to be elastic and full, but avoiding indications of excessive fat or abdominal weakness: 35 points.

Tail.—Medium length, angle about 35 degrees in the male and 20 degrees in the female: 5 points.

Legs.—Medium length, strong, and wide apart; shanks fine in bone and scale, free from feather or fluff; toes straight and well spread; legs and upper portion of feet slate to black; sole of feet white: 5 points.

Plumage.—Soft, close, avoiding fluff and looseness; colour black, with green sheen: 7 points.

Condition.—As indicated by general health, cleanliness of feathers and legs: 10 points.

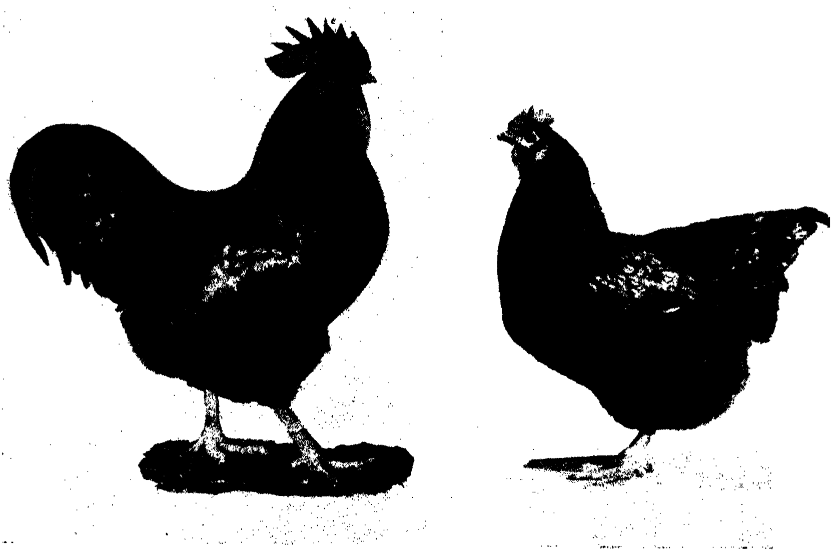


Plate 17.

AUSTRALORPS.

Carriage.—Erect and graceful—that of an active bird: 10 points.

Weight.—Cockerel, 7 lb. to 8 lb.; cock, 8 lb. to 9 lb.; pullet, 5 lb. to 6 lb.; hen, 6 lb. to 7 lb.: 5 points.

Total: 100 points.

Disqualifications.—Side sprigs, any deformity.

Serious Defects.—White in lobes.

The Australorp has been evolved by a process of selection by Australian breeders, from the breed originally known as the Orpington. The Orpington was evolved by Cook, of Kent, Great Britain. Cook states that this breed was made up as follows:—Minorca male mated to a Black Rock female. The female from that mating was mated with Langshan males. The Minoreas used were birds carrying red lobes, and the Langshans were clean-legged.

The Orpington as made by Cook may have been very little different from the Australorp of to-day. It was a breed manufactured for its commercial advantages. Unfortunately, the original Orpington was developed along certain lines by the showman until it reached a stage when it was of no commercial value to the poultry raiser. Those who were interested in the breed from a commercial point of view, however, did not follow the popular craze, but commenced terming the breed "Utility Orpingtons." In the effort to increase the production ability of the breed, birds somewhat longer-bodied and a little closer-in feather were selected for breeding purposes. It is considered that these two features are the only outstanding alterations in the make-up of the Australorp as compared with the Orpington as originally made by Cook.

The Australorp is the most popular dual-purpose fowl in Australia, being a particularly good egg-producer, especially during the first year's production, and at the same time carrying table qualities that are appreciated.

Constant selection has given the industry strains of Australorps in which broodiness is most rare, although the breed is classed as a sitting breed. As no standard existed until 1930, there is considerable variation in types as well as in weight. The weights as laid down by the standard give a bird of sufficient size for table purposes, and breeders should avoid exceeding these weights with the same degree of care as they would employ in guarding against undersized birds.

It is a rapid-maturing breed, pullets laying at the age of five months being not uncommon, while cockerels can be marketed at the live weight of 6 lb. at from eighteen to twenty weeks.

The standard for the breed gives a very good idea of what is required. As the Minorca and Langshan were used originally in the make-up of the Orpington, avoid using birds in the breeding pen showing any whiteness in ear-lobes or feathers on legs. Closeness of feather is desired. Therefore, in breeding, females with obvious cushions should be avoided. A common fault among males is the profuse saddle hackle standing out well from the body. Males of this type tend to produce females with excessive cushion.

In many strains of Australorps there is a tendency for the comb of the bird, instead of following the curve of the head, to run in an upward direction. This is very obvious in males and can easily be selected against, but in females it is not so obvious; therefore it is necessary to give this matter closer attention.

CHINESE LANGSHANS.

General Characteristics.

THE COCK.

Head.—Skull small and full over the eyes. Beak fairly long and slightly curved. Eyes large. Comb single, medium size, straight and upright, showing good clearance back of head, free from side sprigs, evenly serrated with five or six spikes of fine texture. Ear-lobes and wattles medium size. Face to be clean.

Neck.—Of medium length, with a full flowing hackle.

Body.—The back fairly broad, flat, of medium length, saddle abundantly furnished with hackles; breast fairly deep and well-rounded from shoulder to shoulder, not flat; breast-bone straight, with keel level. Wings of medium length, closely carried.

Tail.—Of medium size, carried gradually up and outwards to an angle of about 35 degrees, and medium width, fairly close, furnished with plenty of tail coverts and two secondaries and two sickle feathers slightly longer.

Legs.—Thighs medium length covered with short soft feathers. Shanks of medium length, small-boned, standing well apart and feathered down the outer sides (not too heavily or too scantily).

Feet.—Toes: Four, straight, slender, and well-spread, the outer toe being feathered.

Carriage.—Graceful, neat, and extremely active.

THE HEN.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Colour.—Beak light to dark-horn, not white. Eyes dark-brown. Face free from feathers. Wattles and ear-lobes to be brilliant red. Legs and feet blue-black, showing pink between the scales; the web and bottom of feet pink-white (the deeper the pink the better); toe-nails white.

Plumage.—Dense black with a brilliant beetle-green gloss free from purple or blue tinge, medium texture, not too tight like the Game, not so loose as the Cochin.

Weight.—Cock, 6½ lb.; cockerel, 5½ lb.; hen, 5½ lb.; pullet, 4½ lb. minimum.

Eyes.—Dark-brown or black.

Serious Defects.—Yellow legs; white beak or yellow eyes; five toes; permanent white in the ear-lobes; slate or blue legs in young birds; white feathers; vulture hocks; wry tail; squirrel tail; lop combs; side sprigs; crooked breast-bone amounting to deformity. Deduct up to 5 points for feathers on middle toes. It might be added that the female shape should be free from lumpy or squat appearance, and that the back should be devoid of cushion or fullness at saddle.

The Langshan undoubtedly originated in China, where it has been bred for centuries. The name is derived from the district of Langshan, in China. Major Croad, after whom a variety is named, first introduced this breed into England in 1872. The first introduction of Langshans into Australia is unknown.

Langshans are good table fowls, and the variety known as Chinese or Australian is noted for its egg-laying qualities. This variety has proved itself by repeatedly laying the highest number of eggs in the heavy breed sections of egg-laying competitions. In this regard it is quite comparable with the Australorp. The breed is not so popular as the Australorp, possibly because of the fact that the birds are smaller.

The Chinese Langshan is a very compact bird, exceptionally alert and active, whilst the feathering is fairly close or tight. The face is usually exceptionally free from feathering and bright red—a good feature that should not be overlooked when selecting breeding birds.

The standard calls for black plumage with beetle green sheen. As this is not difficult to obtain, birds with purple or bluish sheen should not be used.

Common faults that may be found are light coloured eyes, feathers on the middle toe, and white feathers. These are features which should be guarded against in the selection of breeding birds.

RHODE ISLAND REDS.

General Characteristics.

THE COCK.

Head.—Skull strong but not thick. Beak curved, moderately long. Eyes large and bright. Comb (*a*) single or (*b*) rose, (*a*) medium size, upright, straight and firmly set with five even serrations; (*b*) low and firm, oval top covered with small points and terminating in a small spike following the curve of the head. Face smooth. Earlobes fine texture, well developed and pendent. Wattles of medium size and moderately rounded.

Neck.—Of medium length and profusely covered with hackle flowing over the shoulders, but not too loosely feathered.

Body.—Fairly deep, broad and long but a distinct oblong rather than square, broad and full breast, long back horizontal except where the neck hackle flows over the shoulders and the saddle gently rises, large wings well folded and the flights horizontal, fairly small tail, sickles passing a little beyond the main feathers, well spread and carried somewhat low (but by no means drooping) to increase the apparent length of the bird.

Legs.—Of medium length, large thighs, well rounded shanks free from feathers, toes (four) straight, strong and well spread.

Carriage.—Alert [illegible] and well balanced.

Weight.—[illegible]

THE HEN.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—[illegible]

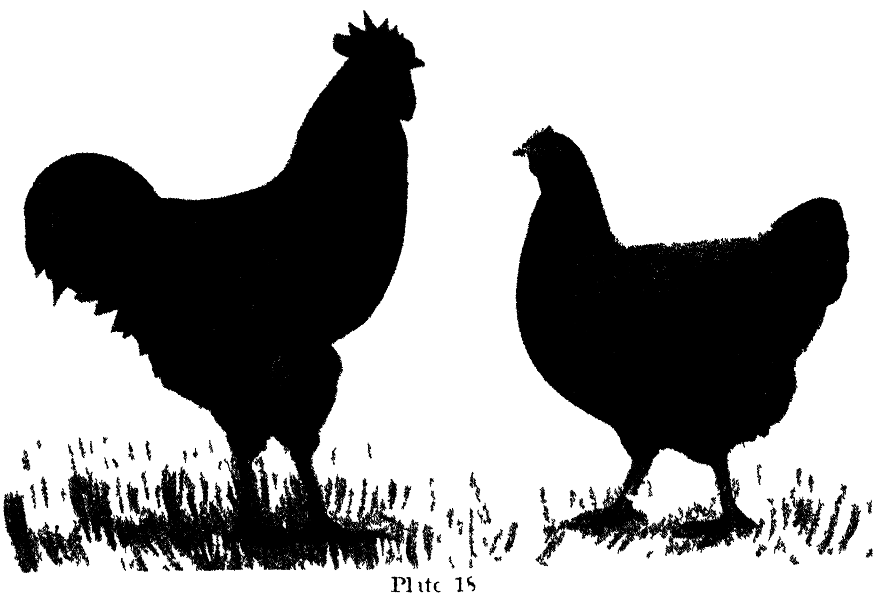


Plate 18.
RHODE ISLAND REDS.

Colour.

Beak red-horn or yellow. Eyes red. Comb, face, ear-lobes, and wattles brilliant red. Legs and feet yellow or red-horn.

Plumage of Cock.—Hackle red, harmonising with the back and breast. Wing primaries, lower web black, upper red; secondaries, lower web red, upper black; flight coverts black; bows and coverts red. Tail (including sickles) black or green-black; coverts mainly black, but may be russet or red as they approach the saddle. Remainder, general surface rich brilliant red, except where black is specified, free from shafting, mealy appearance, or brassy effect; depth of colour (red) is slightly accentuated on wing bows and back, but the least contrast between these parts and the hackle or breast the better, a harmonious blending desirable. The bird should be of so brilliant a lustre as to have a glossed appearance. The under-colour and quills of the feathers should be red or salmon. With the saddle parted showing the under-colour at the base of the tail, the appearance should be red or salmon, not white or smoke. Black or white in the under-colour of any section is undesirable. Other things being equal, the specimen having the richest under-colour shall receive the award.

Plumage of the Hen.—Hackle red, the tips of the lower feathers having a black ticking but not a heavy lacing. Tail black or green-black. Wings as in the cock. Remainder, general surface lighter and more even than in the male, free from shafting or mealy appearance, and except where black is specified a rich even shade of bright red, not as brilliant a lustre as the male. The under-colour and quills of the feathers should be red or salmon. Black or white in the under-colour of any section is undesirable. Other things being equal, the specimen having the richest under-colour shall receive the award.

Scale of Points.

Colour (plumage, &c., 25, eyes 5)	30
Type, including size	30
Quality and texture	15
Head	10
Condition	10
Legs	5

Serious Defects.—Feather or down on shanks or feet, tions of a feather having been plucked from the same; badly lopped combs, side sprig or sprigs on the single comb; entire absence of main tail feathers; two absolutely white (so-called wall or fish) eyes; a feather entirely white that shows in the outer plumage; an ear-lobe showing more than one-half the surface permanently white (this does not mean the pale ear-lobe, but the enamelled white); shanks and feet other than yellow or red-horn; any deformity.

The Rhode Island Red is an American breed which originated on the shores of Narragansett Bay, in the State of Rhode Island. The farmers in that district, with the object of improving the vigour and table qualities of farm flocks, engaged in crossing. The birds introduced for this purpose were Cochin, Brown Leghorn, Malay, and Wyandotte. The result of crossing and selection evidently interested serious-minded breeders in the bird, with the result that in 1901 a standard was drawn up and in 1904 the breed was admitted to the American standard of perfection.

An outstanding character of the Rhode Island Red is its constitution, the bird being of a very hardy nature. It possesses excellent table qualities and matures fairly rapidly, although chickens hatched later than August appear to lag. This may be a matter of individual strain Although the breed is used extensively in some parts of the world for commercial purposes, such is not the case in Queensland. It has been, in the main, a fancier's bird. Colour and size as aimed for on the show bench is probably responsible for the fact that less effort has been made to improve its prolificacy. It is a breed well worth greater attention being given to its production ability by commercial breeders.

In breeding, select standard weight birds. Oversized birds are invariably poor producers, and as there appears a tendency for the breed to revert to the smaller-sized birds of its ancestry, under-sized birds should not be used.

The body of the Rhode Island should approach in shape an oblong rectangle. It should be carried level and the line of the back kept horizontal. The wings should have no tendency to drop but should be carried on a level with the back. The back should be flat from front to rear and also from side to side. It needs to be wide, and the width carried the full length of the body. The breast should be full and prominent to fill in the rectangular shape. A perpendicular line from the breast should meet the base of the beak. The bird should be well balanced, with legs under the centre—shanks fairly stout and of medium length, stiltiness to be avoided.

Colour of eye in females tends to fade with production, and some good-eyed birds as pullets will have pale or greenish eyes as hens. Old birds with good eye colour are most valuable breeders. Select against dark or blackish streaks in beaks, as this fault is troublesome. Do not breed from extremely dark males, as females from this mating will invariably be mottled. Matings should consist of rich snappy coloured males of even shade in hackle, wing-bows, and saddle, and females which are dark rich and even in colour. In addition to depth of colour the plumage should be lustrous bright and alive and not a dead brown or chocolate.

With age white may appear in the back and saddles of males, but if the bird was sound as a cockerel it is not a very serious defect. Very few hens approach closely their pullet colour. Those that do are most desirable breeders.

WYANDOTTES.

General Characteristics.

THE COCK.

Head.—Skull short and broad. Beak stout and well curved. Eyes intelligent and prominent. Comb rose, firmly and evenly set, low, square-fronted, gradually tapering towards the back and terminating in a well-defined spike or leader, which should follow the curve of the neck without any upward tendency; the top of it oval and covered with small and rounded points, the side outline being convex to conform to the shape of the skull. Face smooth and fine. Ear-lobes oblong, well developed, and smooth. Wattles of medium length, fine, and well rounded.

Neck.—Of medium length, well covered with hackle.

Body.—Short and deep, with well-rounded sides; broad round breast with straight keel; short back with full and broad saddle rising with a concave sweep to the tail; wings of medium size, well folded; tail medium size, but full, spread at base, the main feathers carried rather upright, the sickles of medium length.

Legs.—Of medium length. Thighs well covered with soft and webless feathers, the fluff fairly close and silky. Shanks strong, fine, well rounded, and free of feather or fluff. Toes (four) straight and well spread.

Carriage.—Graceful and well balanced, alert and active, but docile.

Plumage.—Fairly close and silky, not too abundant or fluffy.

Weight.—8½ lb.; cockerel, 7 lb.

THE HEN.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—7 lb.; pullet, 5½ lb.

Colour.

Beak bright yellow, except Columbian, yellow, or horn. Eyes bright bay. Comb, face, wattles, and ear-lobes bright red. Legs and feet bright yellow.

Plate 19.
WHITE WYANDOTTES.

THE COLUMBIAN.

Plumage.—Pearl-white with black markings; primaries (wing), black or black edged with white; secondaries, black inner web and white outer; the cock's neck-hackle broadly striped with black down the centre of each feather, such stripe to be entirely surrounded by a clearly-defined white margin with a decided white point (free from black outer edging or black tips) and his tail glossy green-black, the coverts either laced or not with white; the hens hackle bright intense black, each feather entirely surrounded by a white margin, and tail feathers black, except the top pair, which may or may not be laced with white. Remainder (in both sexes), white, entirely free of ticking, with slate, blue-white, or white under-colour.

THE WHITE.

Plumage.—Pure white, free from yellow or straw tinge.

Scale of Points.

THE COLUMBIAN.

Colour and markings (body 15, hackle 10, tail 5, flights 5, legs 5)	40
Type	25
Head (comb 10, eyes 5)	15
Size 8, condition 7	15
Texture	5
	100

THE WHITE.

Type	25
Colour	25
Size	15
Head	15
Legs	10
Condition	10
	100

Serious Defects.—Any feathers on shanks or toes; permanent white or yellow in ear-lobe, covering more than one-third of its surface; comb other than rose, or falling over one side, or so large as to obstruct the sight; shanks other than yellow (except in adult cocks and hens, which may shade to light straw); any deformity. In Whites other than white feathers; in Columbians, brown under-colour, green eyes, coarseness, inactivity, overhanging eyebrows.

The Wyandotte is an American breed, which is not bred extensively in this State. It is another breed made by a series of crosses. The first cross is believed to have been between the Sebright Bantam and Cochin Hen, and later Silver Spangled Hamburg, Buff Cochin, and Dark Brahma. The breed did not become popular commercially until the White was developed. This was a sport from the Silver breed.

The commercial possibilities of the breed were then visualised, as the breed was hardy, a good forager, docile, and the chickens grew rapidly. The type of the Wyandotte ensures a carcase pleasing to the eye at any stage of development, and as its laying capacity was increased, it soon became popular; in fact, in Great Britain it is as popular as the White Leghorn.

This breed can be termed "the breed of curves." It is well-balanced, with legs set in the centre. From the top of its back to the bottom of its feet the distance should equal that from its breast to end of tail. The body is carried horizontally, and depth of body is to be maintained. The maintenance of size is important, but coarseness has to be avoided. A good breadth of body and back is necessary to retain the meat-carrying characteristics of the carcase.

The principal eye defect is colour. Too many have light or almost green eyes. Age is responsible for some of this trouble, but greater selection for eye colour is desirable. Whiteness or paleness is the principal defect in the lobe.

The back has the appearance of being short, due to the curves and abundant hackle, saddle, and general set of the tail. The back shows a short space above the shoulders which is level and then rises towards the tail, blending smoothly and evenly, making it difficult to see where the back terminates and the tail begins. This is what gives the Wyandotte this short appearance. The back should be broad with well-furnished saddle in the male, and a slight cushion or fullness of back held well up by a well-spread tail in the female. This gives the back line of the female from back to the end of the tail a slightly convex outline without the appearance of a Cochiny cushion. Breadth of back carried out in breadth of body, so that the side line of the fowl viewed from above shows smooth and even without hollow indentations, is to be aimed at. The breast must be full and prominent, not low enough to cover the hock line. The tendency to concave breasts, especially on side, and prominent gullet, is to be avoided.

The wings should not be too long; they should be folded snugly and carried level. Low-carried and slanting wings are more common in males than females. The top of the tail should be about level with the junction of the head and neck. Fairly full fluff is desired, but not so full as to hide the thighs. Do not go to the extreme and make the birds too fluffy.

The Columbian.—The black of the Columbian is often inclined to be faded and not intense, and the strong contrast with the white is lost. This is offset by using breeding birds with dark slate under-colour. Select breeders with a clear white surface, with ½-inch to 1½-inch dark

slate under-colour running to white next to the body. To attain the greatest success, keep away from breeders with pure white under-colour and save as breeeders those showing no black on surface or white sections. It is also necessary to guard against brassiness, as this is a serious defect. It is more apparent in males and may appear on hackle, wing-bow, back, and saddle. In females it is more apparent in the white lacing of the hackle.

PLYMOUTH ROCK.

General Characteristics.

THE COCK.

Head.—Skull strong, but not thick. Beak short and stout. Eyes large and bright. Comb single, medium size, straight, and erect, with well-defined serrations, free from side sprigs. Face smooth. Ear-lobes fine texture, well-developed, and pendent. Wattles to correspond with size of comb, and moderately rounded.

Neck.—Of medium length and profusely covered with feathers flowing over the shoulders.

Body.—Large, deep, and compact; broad and well-rounded breast; broad back, of medium length, with saddle feathers of medium length and abundant; medium-sized wings carried well up, the bows and tips covered by the breast feathers and saddle-hackles.

Tail.—Rather small, rising slightly from the saddle, the sickles of medium length and nicely curved, the coverts being sufficiently abundant to cover the stiff feathers.

Legs.—Wide apart, stout, and strong, thighs 2 to 3 inches long (from hock to body), with shanks of medium length and free of feathers. Toes (four) strong, straight, and well spread.

Carriage.—Upright and smart.

Weight.—10 lb. to 12 lb.; cockerel, 8 lb. to 10 lb.

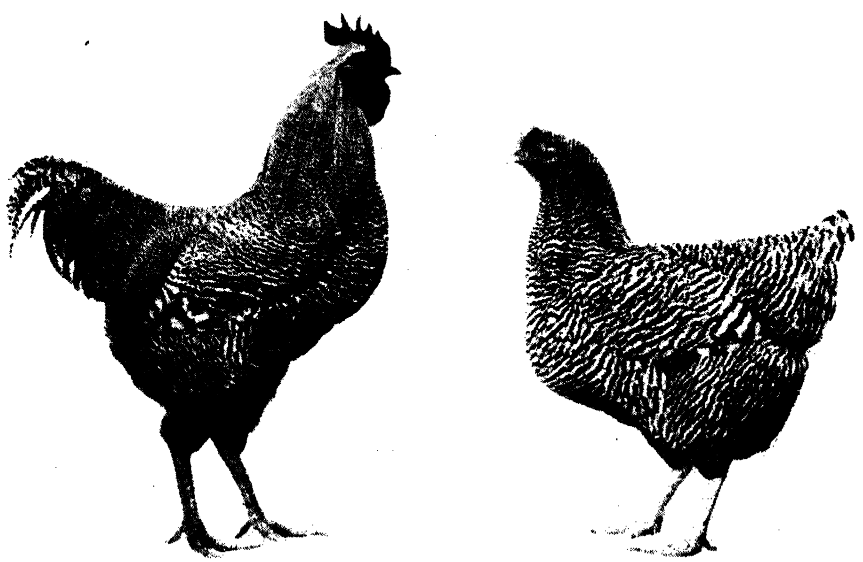


Plate 20.

Barred Plymouth Rock.—Pullet Line.

THE HEN.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—7 lb. to 8 lb.

Colour.

Beak bright yellow. Eyes clear, rich bay. Comb, face, ear-lobes, and wattles bright red. Legs and feet bright yellow.

THE BARRED.

Plumage.—White, of blue tinge, each feather barred across with black of a beetle-green sheen, the bands moderately narrow and of equal breadth, and the colours sharply defined and not shading into each other. The barring should continue through the shaft of the feather and into the fluff and under-colour, and each feather finish with a black tip. The plumage as a whole should present a blue appearance and be uniform—that is, the hackles, wing-bows, and tail corresponding in colour with the other part of the body.

Scale of Points.

THE BARRED.

Type	20
Colour	20
Barring	20
Legs and feet	10
Condition	10
Size	10
Head	5
Tail	5
	100

Serious Defects.—The slightest fluff or feather on the shanks or feet; shanks other than yellow; white ear-lobes; black, red, or white feathers in the Barred.

The Plymouth Rock originated in America. Several lines of barred Plymouth Rocks were developed and united in 1878 to produce the modern breed. In its make-up the American Dominque, the Black Cochin, the White Brahma, and Minorca appear to have been employed.

The barred Rock was a larger-framed bird and a fair producer, with the result that it became very extensively used for commercial purposes in America and Canada. In Queensland, although individual breeders have competed in egg-laying tests, the Rock has figured largely as a breed for the fancier and/or those engaged in the production of their own requirements of eggs and poultry meat.

There is a tendency in both sexes for size to deteriorate, and in breeding birds of standard weight or a trifle over should be selected. Extremes in size, however, should not be aimed for, as this will tend to depreciate the general utility characteristics of the breed. Light or greenish eyes should be avoided. White in lobe is a trouble with which breeders have to contend, although the whiteness which develops with age is not as serious as that in young stock. Split or slipped wings is a trouble fairly prevalent and to be selected against. Another wing trouble that must be avoided is twisted wing flights, which it is claimed suggest constitutional weakness.

Dark spots or green-shaded legs are frequently noted in females. This trouble is difficult to keep out, and constant attention is necessary. Dark shading will also be found in the beak of the female. It is not a serious defect—although yellow is preferable. Long shanks are associated with knock-knees and crooked toes. In addition to the defects already referred to, excessively slow-feathering birds should be avoided in breeding Rocks. These are more prevalent among males than female chickens.

Barred Rocks are bred exclusively by double mating, and cockerel-bred lines and pullet-bred lines are now definitely fixed. The crossing of cockerel and pullet lines would be disastrous from a standard point of view, and it is necessary, therefore, to carry on with the system.

It is as well to point out that black feathers appear among the plumage of the barred Rock. This does not indicate impurity of breed, nor are black feathers a serious defect unless numerous.

Cockerel Mating.—The male to be used should be standard. In colour the female needs to be clean black and white, with no sign of smut. The black bar should be two or three times as wide as the white. Surface colour even in all sections, with under-barring well defined. Some females will have black feathers and even some black wing flights. This denotes plenty of pigment and will assure strong barring in progeny. The colour of the legs and beak is usually darker than exhibition females.

Pullet Mating.—With this mating, we look for the female progeny to have a barring of equal width, the black as black as possible without sheen and the white as white as possible. In this mating use males with white barring two to three times as wide as the black, and females of standard colour.

SUSSEX.

General Characteristics.

THE COCK.

Head.—Skull of medium size. Beak short, strong, and well curved. Eyes full and bright. Comb single, of medium size, upright, evenly serrated, and fitting closely. Face smooth. Ear-lobes and wattles of medium size.

Neck.—Of medium length, with fairly full hackle.

Body.—Broad, deep, and long; square breast and carried well forward with long and deep breast-bone; wide shoulders; broad and flat back; wings carried closely; tail of moderate size, carried at an angle of 45 degrees.

Legs.—Short and rather wide apart, the thighs stout and the shanks strong and free from feathers. Toes (four) straight and well spread.

Carriage.—Graceful, showing length of back, vigorous and well balanced.

Plumage.—Close and free from any unnecessary fluff.

Weight.—9 lb.

THE HEN.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—7 lb.

Colour.

Beak white or horn. Eyes, comb, face, wattles, and ear-lobes red. Legs and feet white. Flesh and skin white.

THE LIGHT.

Plumage.—Pure white, with black-striped neck-hackle, black in flights, and black tail, the black centre of each feather of the neck-hackle to be entirely surrounded by a white margin.

Scale of Points.

Type	25
Size	20
Colour	20
Legs and feet	15
Head	10
Condition	10
	100

Serious Defects.—Rose comb; feather on shanks; other than four toes; any deformity.

The Sussex was developed in the South of England, but the breeds of fowls used are not definitely known, although it is generally believed that the Silver Grey Dorking entered extensively into its make-up.

The Sussex was developed primarily for its table qualities. Its white flesh, legs, and feet appeal to consumers. This fact, combined with the tenderness and juiciness of flesh and smallness of bone, enhances its table value. Although regarded as a table fowl, the Light Sussex is a fair layer, but the quality of flesh should not be sacrificed by efforts to increase the egg production.

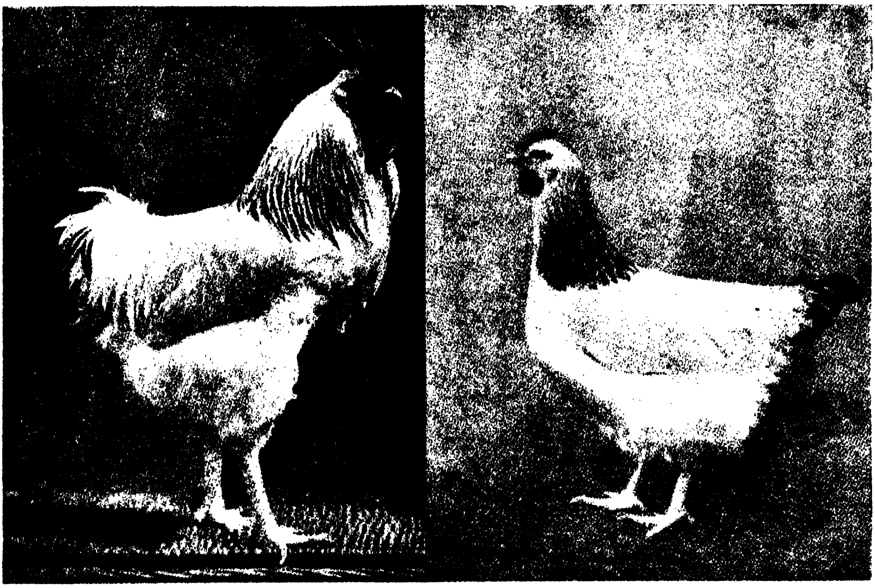


Plate 21.
LIGHT SUSSEX.

A characteristic of the breed is that the rectangular body is reasonably long, deep, and wide. The breast-bone is reasonably long and well-fleshed. The head is somewhat coarse when compared with other utility breeds, but this can be overcome by selection.

The Light.—As indicated, the back is fairly long. This must not be overlooked, as there is a tendency for the back to be too short. Cut-away or flat breasts are very common, and this is a serious fault. Avoid any sloping or rounding of the back.

The Sussex, being descended from the Dorking, occasionally has five toes; this is definitely a disqualification on the show bench, and also as a breeeder.

Plumage colour is clearly outlined in the standard. The principal faults are brassiness in males and dark or slaty under-colour. These are difficult to breed out.

DUCKS.

THE MUSCOVY.

General Characteristics.

Head.—Large, adorned with small crest of feathers (more pronounced in the male than the female), which are raised erect in excitement or alarm.

Caruncidations (fleshy protruberances).—On face and over the base of the bill.

Bill.—Wide and strong, of medium length and slightly curved.

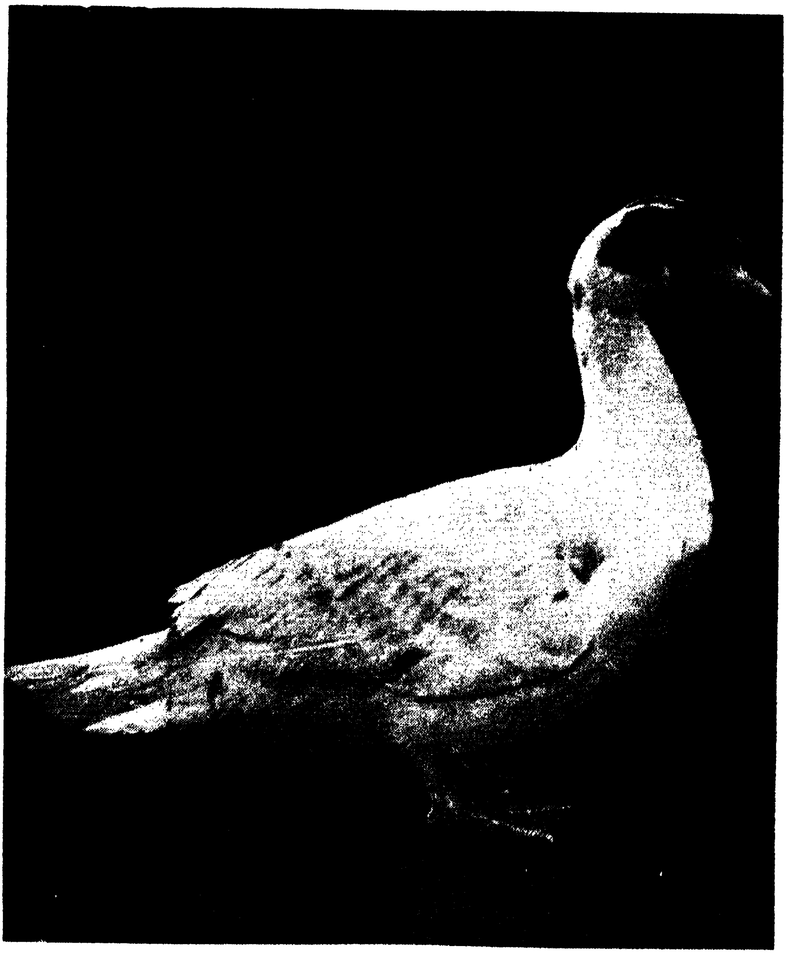
Eyes.—Large, with wild or fierce expression.

Neck.—Of medium length, almost erect, and strongly built.

Body.—Broad, deep, powerfully built, and very long, with full and well-rounded breast carried low down; keel long, well-fleshed, just clear of ground and slightly rounded from stern to stem.

Wings.—Very strong and long, and carried high.

Tail.—Long and carried low to give the body a longer appearance to the eye, and a slightly curved outline to the top of the body.



[*Block by courtesy "Red Comb Bulletin."*

Plate 22.

A TYPICAL MUSCOVY DRAKE.

Legs.—Strong, wide apart, and fairly short, feet straight and webbed, with pronounced toenails; thighs short, strong, and well-fleshed.

Carriage.—Low and jaunty.

Condition.—Hard, well-fleshed, and muscular; plumage close.

Weight.—Drake, 10 lb. to 14 lb.; duck, 5 lb. to 7 lb. It is a characteristic of the breed for the male to be about twice the size of the female.

Colours of Varieties.

White-Winged Black.—Dense black throughout, except for white wing bows, the black to carry a metallic green sheen or lustre, with bronze on the breast and parts of the neck.

White-Winged Blue.—Blue, except for white wing-bows.

Black.—Dense beetle-green black throughout, with bronze on the breast and parts of the neck.

White.—Pure white throughout.

Blue.—Light or dark shade permissible.

Black and White.—Black and white, with defined regularity of markings.

Blue and White.—Blue and white, with defined regularity of markings.

Variations in Colour.

There are colour variations according to the countries of importation. Eye colour may vary from yellow and brown to blue; leg colour from yellow and mottled to black; bill colour from yellow to black, red or flesh colour or a lighter shade at the point. In the black and white, also the blue and white, it is customary in some countries for the black or blue to predominate in winning specimens at the shows. The face and caruneulations can be red or black. For these reasons type and characteristics are, for the time being, to be considered of major importance in judging.

Scale of Points.

Shape and carriage	40
Head points (including crest and caruneulations)	20
Size	20
Condition	10
Colour	10
	100

The Muscovy breed originated in South America. They are very hardy, make rapid growth, and are bred extensively for table purposes. Muscovies are indifferent layers.

The body is somewhat rectangular in shape, being slightly arched on the top. The abdomen of the laying duck sags. The carriage is nearly horizontal. The legs are short and very thick. They are very slow at walking, the drake being particularly clumsy. The drake has no curled feathers in the tail.

KHAKI CAMPBELL.

General Characteristics.

Head.—Refined in jaw and skull, with smooth and full face. Bill proportionate, of medium length, depth, and width, well set in a straight line with top of skull. Eyes full, bold, and bright, showing alertness and expression, high in skull and prominent.

Neck.—Of medium length, slender, and refined, almost erect.

Body.—Deep, wide, and compact, appearing slightly compressed, retaining depth throughout, especially from shoulders to chest and from middle of back through to thighs; broad and well-rounded front; wide back, flat and of medium length, gently sloping with shoulders higher than saddle; abdomen well developed at rear of legs, but not sagging; well-rounded underline of breast and stern; closely carried and rather high wings; short and small tail, rising slightly, the drakes with the usual curled feathers.

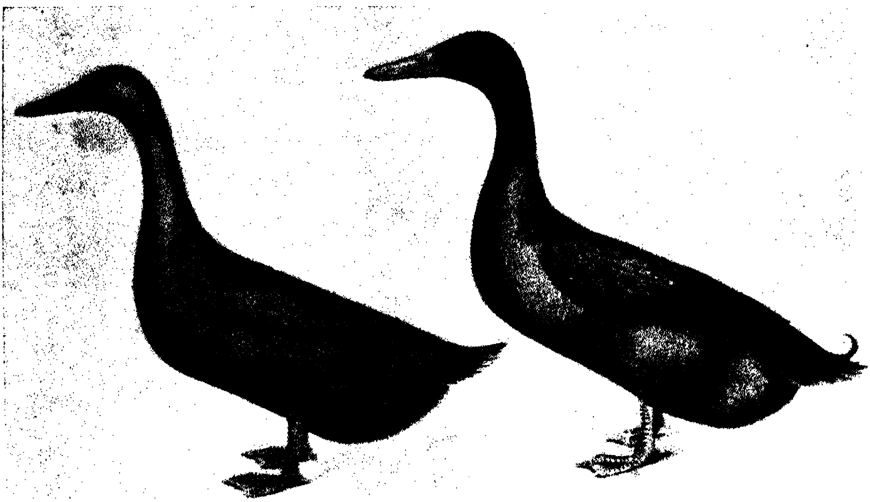
Legs.—Of medium length and well apart to allow of good abdominal development; not too far back; feet straight and webbed.

Carriage.—Alert, slightly upright and symmetrical, the head carried high, with shoulders higher than the saddle, and back showing gentle slant from shoulder to saddle, the whole carriage not too erect, but not as low as to cause waddling—activity and foraging power should be retained without loss of depth and width of body generally.

Quality or Refinement.—While aiming at good body size emphasis should be placed upon quality or refinement in general., i.e., neat bone, sleek silky plumage, smooth face, fine head points, &c., with absence of coarseness and sluggishness.

Plumage.—Tight and silky, giving sleek appearance.

Weight.—4½ lb. for birds in laying condition in their prime.



[*Original by Wippell from "Poultry Breeding" by Brown.*

Plate 23.

KHAKI CAMPBELL DRAKE.

Colour.

THE DRAKE.

Bill green, the darker the better. Legs and feet dark orange.

Plumage.—Head, neck, stern, and wing-bar bronze, a brown shade preferred to green bronze. Remainder an even shade of warm khaki.

THE DUCK.

Bill greenish black. Legs and feet as near the body colour as possible.

Plumage.—Khaki all over, ground colour as even as possible, back and wings laced with lighter shade; lighter feathers in wing-bar allowable, but head plain khaki, streak from eyes considered a fault.

Scale of Points.

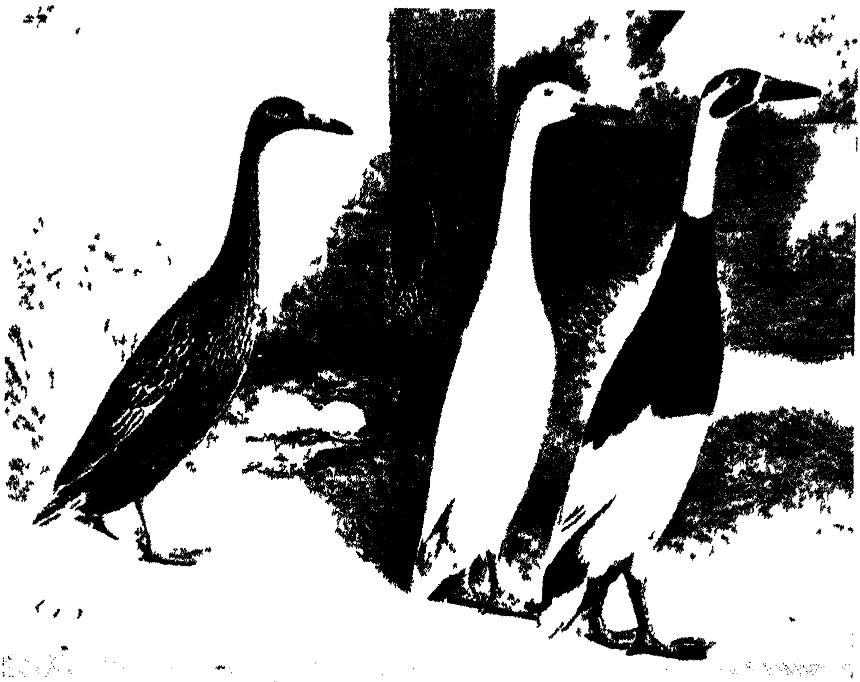
Type (shape and carriage)	25
Colour	25
Quality or refinement	15
Head points	10
Size and symmetry	10
Condition	10
Legs and feet	5
	100

Serious Defects.—Yellow bill; white bib; any deformity; green eggs.

The Khaki-Campbell breed was evolved by crossing Rouen, Indian Runner, and Mallard ducks. It is bred mainly for egg production. It is a very highly strung and nervous breed and must be handled most carefully.

The laying of white-shelled eggs is a very strong feature, therefore special attention must be given to breeding by discarding all greenish-tinted-shelled eggs from incubators.

There is a tendency for this duck to lose size, therefore, in breeding, undersized birds should be avoided.



[*Original by A. J. Simpson, "Feathered World" (England).*

Plate 24.

Indian Runner Ducks.—The Fawn, the White, and the Fawn and White.

THE INDIAN RUNNER.

General Characteristics.

Head.—Lean and racy looking and, with the bill, wedge shaped. Skull flat on top, and the eye-socket set so high that its upper margin seems almost to project above the line of the skull. Eyes full, bright, very alert, and intelligent. Bill strong and deep at the base where it fits imperceptibly into the skull, the upper mandible very strong and nicely ridged from side to side, and the line of the lower mandible straight also. There should be no depression or hollow in the upper line from its tip to its base; and the outline should run with a clean sweep from the tip of the bill to the back of the skull. The length and depth varies, but should never be out of balance or harmony with the rest of the head and the lines of the bird as a whole.

Neck.—Fine, long, and graceful, and when the bird is on the move or standing at attention, almost in a line with the body, the head being high and slightly forward. The thinnest part is approximately where, in Fawn drakes, the dark bronze of the head and upper neck joins the lower or fawn of the neck proper; the muscular part should be well marked, rounded, and stand out from the windpipe and gullet, the extreme hardness of feather helping to accentuate this. The neck should be neatly fitted to the head.

Body.—Slim, elongated, and rounded, but slightly flattened across the shoulders. At the lower extremity the front line sweeps gradually round to the tail, which is neat and compact and almost in a line with the body or horizontally, but in some excellent birds slightly elevated or tilted upwards—the position of the tail varying with the attitude of the duck, but habitually upturned sterns and tails (as in the Pekin duck) considered objectionable. Stern short compared with other breeds, the prominence of the abdomen and stern varying in ducks according to the season and the age of the bird, being fuller when in lay; but a large pendulous abdomen and long stern or a "cut away" abdomen and stern in young ducks to be avoided. Wings small in proportion to the size of the bird, tightly packed to the body and well tucked up, the tips of the long flights of the opposite wings crossing each other over the rump, more particularly when standing at attention. At the upper extremity the body gradually and imperceptibly contracts to form a funnel-shaped process, which again, without obvious junction, merges into the neck proper, the lower or thickest portion of this funnel-shaped process or "neck expansion" being reckoned as part of the body.

Legs.—Set far back to allow of upright carriage. Thighs strong and muscular, longer than in most breeds. Shanks short and feet supple and webbed. There should be sufficient width between the legs to allow of free egg production, but not as much as to cause the duck, on actual test, to roll or waddle when in motion.

Length.—Total length of drake 26 inches to 32 inches and duck 24 inches to 28 inches. Length of neck proper, from top of skull to where it joins the thick part of the "funnel," about one-third the total length of the bird, not less. Measurements should be taken with the bird fully extended in a straight line, the bill and head in a line with the neck and body, and the legs and feet in the same straight line, the measurements being from the tip of the bill to the tip of the middle toe.

Plumage.—Tight and hard.

Carriage.—Upright and active. The "angle of inclination" of the body to the horizontal varies from 50 degrees to 70 degrees when on the move and not alarmed; but when standing at attention, or excited, or specially trained for the show-pen, it may assume an almost perpendicular pose.

Weight.—Drake, 4 lb. to 5½ lb.; duck, 3½ lb. to 5 lb. Birds bred and shown in the same year as hatched may be accepted for competition at ½ lb. less.

THE FAWN DRAKE.

Bill pure black to olive-green, mottled with black, and black bean. Legs and feet black or dark tan, mottled with black.

Plumage.—Head and upper part of the neck dark bronze with metallic sheen, which may show a faint green tinge, meeting the colour of the lower part of neck with a clean cut or the lower colour merging into it imperceptibly. Lower neck and "neck expansion" rich brown-red continued on to the breast, over the shoulders, and upwards to where it joins the head and upper neck colour, merging gradually on the back and breast into the body colour. Lower chest, flanks, and abdomen french-grey, made up of very minute and dense peppering of dark brown, or almost black, dots on a nearly white ground, giving a general grey effect without any show of white, the grey extending beyond the vent until it meets the dark or almost black feathers of the cushion under the tail. Scapulars (the long-pointed feathers on each side of the back covering the roots of the wings) red-brown, peppered. Back and rump deep brown, almost black. Tail (fan feathers and curl) dark brown, almost black. Wings, bow fawn, not pencilled; bar fawn, corresponding with the coverts in the lower part, the upper part darker brown, corresponding with the secondaries, which are black-brown with slight metallic lustre; primaries, brown, fairly dark. (*Note.*—When the drake is in "eclipse" or duck plumage he more closely approaches the duck in colour. All the dominant colours fade, but his head and neck are darker than the duck's; the body becomes a dirty fawn or ash, with perhaps some rustiness on the breast.)

THE FAWN DUCK.

Bill black. Eye iris golden-brown. Legs and feet black or dark tan.

Plumage.—The general colour an almost uniform ginger-fawn, with no marked variation of shade, and a slightly mottled or speckled appearance. When closely examined the head, neck, lower part of chest, and abdomen may appear a shade lighter than the rest of the body. Each feather of the head and neck has a fine line of dark red-brown, giving a ticked appearance. Lower part of neck and "neck expansion" a shade warmer, each feather pencilled with a warm red-brown.

Scapulars rich ginger-fawn, a shade darker than the shoulder and back, with well-marked red-brown pencilling. Wing, bow a shade lighter than the scapulars but darkening towards the bar, the feathers pencilled as before; secondaries, warm red-brown; primaries, a shade lighter. Back and rump darker, the pencilling being richer and more marked, but the ground colour becomes lighter and warmer towards the tail. Tail lighter, each feather pencilled. Belly lighter than upper parts of body, about the same shade of fawn as the head and neck, becoming a trifle darker on the tail-cushion, all feathers pencilled.

THE FAWN AND WHITE.

Bill light orange-yellow in young birds; entirely, or almost entirely, dull cucumber in adult duck, and green-yellow in the adult drake. Legs and feet orange-red.

Plumage.—Cap and cheek markings in the duck nearly the same shade of fawn as the body colour, but dull bronze-green in the drake. The cap separated from the cheek markings by a projection from the white of the neck extending up to, and in most cases terminating in a narrow line more or less encircling, the eye. The cap should come round the back of the skull with a clean sweep—there should be no "tails" to it. The cheek markings should not extend on to the neck. Bill divided from head markings by a narrow prolongation of the neck-white, from ⅛ inch to ¼ inch wide, extending or projecting from the white underneath the chin. Neck pure white to about where the "neck-expansion" begins and meeting the body with a clean cut. Body uniform soft warm or ginger-fawn to the skin. The rump and tail of the drake, including the under surface of his tail, a similar hue to his head. When closely examined the coloured body-feathers of the drake show a soft warm ground slightly peppered with a rather warmer shade—that is, the colour seems solid and more ruddy than that of the duck. The duck should have the same shade of fawn as the Fawn duck. The fawn and the white should meet on the breast with an even cut about half-way between the point of the breast-bone and the legs. The base of the neck, upper part of wings, back, and tail should be as nearly as possible the same colour as the fawn of the breast, and from the fawn of the back an irregular branch on either side extending downwards on the thighs to, or nearly to, the hough. The white of the breast extends downwards between the legs to beyond the vent and may overlap the thighs in part. Wings, primaries, secondaries, and lower part of bow pure white, which gives the appearance of a "heart" laid flat on the bird's back.

THE WHITE.

Bill, legs, and feet orange-yellow. Eye iris light-blue or grey-blue.
Plumage.—Pure white throughout.

Scale of Points.

Body (shape and general appearance of, including the lower part of neck, legs, and feet)	45
Carriage and action	20
Head, eyes, bill and neck (exclusive of lower neck expansion)	20
Colour and condition	15
	100

Serious Defects.—Above and below standard weights and measurements; body squat and short, oval or flattened; domed skull with central position of eyes; bill dished, weak, "Roman," under-curved, or flat; neck thick and short, swan, or curved; neck-expansion too far back on body, causing a chesty appearance in front with a hollow behind; legs set too far forward, causing poor carriage; waddling or rolling gait; a natural carriage in any duck below 40 deg.; long stern; wry tail; flattened back; slipped wing or any deformity. In Fawns, white anywhere; eyebrows or eye-stripes; light or cream wings (bows, coverts, and flights), in the duck; blue or green wing-bars; orange or yellow bill, feet or legs.

It is generally believed, as the name implies, that the Indian Runner duck originated in India.

It is the smallest of all domestic ducks, and there is a general tendency for the breed to decrease in size; this indicates the necessity of using as breeders birds which conform to the standard weights. Primarily this breed is kept for its prolific laying qualities, and to maintain these features any indication of coarseness must be avoided.

GEESE.

THE TOULOUSE.

General Characteristics.

Head.—Strong and massive. Bill strong, fairly short, and well set in a uniform sweep, or nearly so, from the point of the bill to the back of the skull. Eyes full.

Neck.—Long and thick, the throat well gulleted.

Body.—Long, broad and deep; prominent breast, deep and full, the keel straight from stem to paunch, increasing in width to the stern and forming a straight underline; broad shoulders; back slightly curved from the neck to the tail; large and strong wings; somewhat short tail carried high and well spread; paunch and stern heavy and wide, with a full rising sweep to the tail.

Legs.—Short; shanks stout and strong boned; straight toes connected by web.

Carriage.—Somewhat horizontal, not as upright in front as the Embden, and thick set.

Plumage.—Full, somewhat soft.

Weight.—Gander, 28 lb. to 30 lb.; goose, 20 lb. to 22 lb.

Colour.

Bill, legs, and feet orange. Eyes dark brown or hazel.

Plumage.—Neck dark-grey. Breast and keel rather light-grey, shading dark to thighs. Back, wings, and thighs dark steel-grey, each feather laced with an almost white edging, the flights without white. Stern, paunch, and tail white, the tail with a broad band of grey across the centre.

Scale of Points.

Type (head and throat, 15, breast and keel, 10, tail, stern, and paunch 10, neck 5, general carriage 15)	55
Size	20
Colour and markings	10
Condition	10
Legs and feet	5
	100

Serious Defects.—Patches of black or white among the grey plumage; slipped or cut wings; any deformity.

THE EMBDEN.

General Characteristics.

Head.—Long and straight. Bill fairly short, stout at base. Eyes bold.

Neck.—Long and swan-like, the throat uniform with the under mandible and neck—i.e., without a gullet.

Body.—Broad, thick and well rounded; round breast, with very little, if any, indication of keel; broad shoulders and stern; long straight back and deep paunch; large and strong wings; close tail, carried well out.

Legs.—Fairly short; large and strong shanks; straight toes connected by web.

Carriage.—Upright and defiant.

Plumage.—Hard and tight.

Weight.—Gander, 30 lb. to 34 lb.; goose, 20 lb. to 22 lb.

Colour.

Bill orange. Eyes light-blue. Legs and feet bright orange.

Plumage.—Pure glossy white.

Scale of Points.

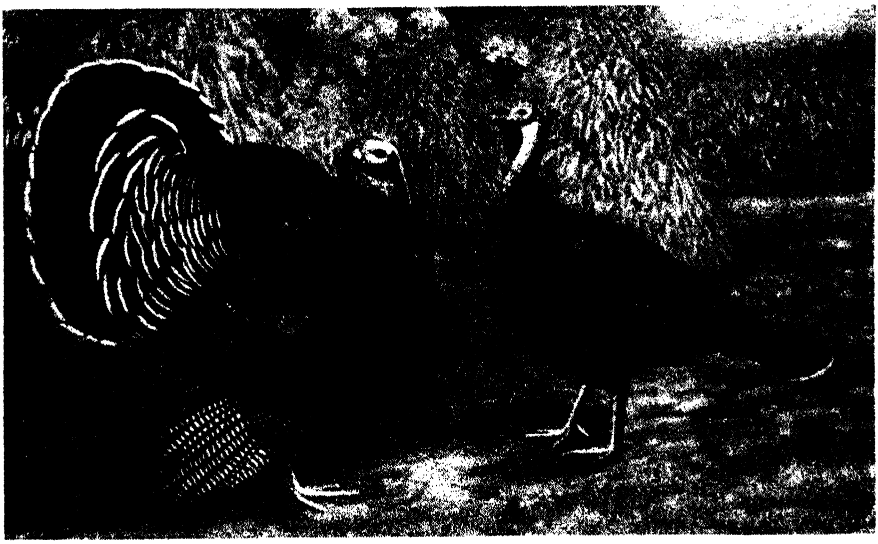
Type (breast 20, head 12, general carriage 12, neck 10)	54
Size	20
Colour	10
Condition	10
Legs and feet	6
	100

Serious Defects.—Plumage other than white; any deformity.

The Toulouse.—This breed originated in France. It is grey in colour, with the exception of the lower portion of the body, which is white. The bill is pale-yellow and the legs and feet reddish-orange. The bird is large in frame and loosely feathered, giving it a massive appearance.

The Embden.—This is a white goose with bright blue eyes; bill and legs of orange colour. It is a large and compact goose. The females are excellent layers and good mothers. The young goslings are very hardy and make rapid growth.

The farm, with facilities for free range and an abundance of green feed, is the natural habitat of the goose. Although the keeping of geese on a large scale is not recommended, a small flock upon the farm will be found economical and profitable to keep.



[*By courtesy of "Poultry Tribune," Mount Morris, Ill., U.S.A., and reproduced from "Poultry Breeding" by Brown.*

Plate 25.

Bronze American Turkeys.

TURKEYS.

General Characteristics.

Head.—Long, broad, and carunculated (covered with fleshy protuberances). Beak strong, curved, and well set. Eyes bright and bold. Throat wattle large.

Neck.—Long and curved back when strutting, the top and most of the front carunculated.

Body.—Long, deep through the centre, and well rounded; broad and full breast, the cock's beard long, bristling and prominent; back somewhat curving, rising from the neck to the centre and descending in a graceful slope to the tail; large and powerful wings carried well up and closely to the side; long and drooping tail, the end almost touching the ground.

Legs.—Fairly long. Shanks large and strong. Toes (four) straight and powerful, well spread.

Carriage.—Stately and upright.

Plumage.—Hard and glossy, with short fluff.

Weight.—Bronze: cock, 30 lb. to 50 lb.; cockerel, 25 lb. to 35 lb.; hen, 18 lb. to 26 lb.; pullet, 14 lb. to 22 lb. Other breeds: cock, 25 lb. to 40 lb.; cockerel, 18 lb. to 25 lb.; hen, 14 lb. to 20 lb.; pullet, 12 lb. to 18 lb.

Colour.

THE BLACK.

Beak dark horn or slate-black. Eyes dark hazel. Head (including face, jaws, throat wattle, and caruncles) brilliant red, changeable to blue-white. Legs and feet dark lead or slate black.

Plumage.—Lustrous black.

THE BRONZE.

Beak horn. Eyes, dark-hazel iris and blue-black pupil. Head as in the black. Legs and feet black or horn.

Plumage.—Body rich metallic bronze throughout; black flights, with a definite white barring; black and brown tail, with a broad black band edged with white.

THE BUFF.

Beak horn. Legs and feet flesh-coloured.

Plumage.—Deep cinnamon brown, except flights and secondary feathers (in wings), which are white and thigh-fluff buff.

THE WHITE.

Beak pink or flesh. Eyes and head as in the Bronze. Legs and feet pink (flesh colour).

Plumage.—Pure white; the cock's beard a deep black.

Scale of Points.

Type	25
Weight	25
Colour	20
Head, neck, and wattle	15
Legs and feet	10
Condition	5
	100

Serious Defects.—Wry tail; crooked breastbone; any other deformity. In the Buff, white in tail.

All races of domesticated turkeys are undoubtedly descendants of the wild turkey of North America. They are more or less game, and thrive well when they have access to open grassed country.

The raising of turkeys can be made a profitable undertaking where they have range and can gather some of their own food requirements in the form of grass seeds, &c. In many countries turkey-raising is engaged in upon an extensive scale and conducted more or less upon the lines employed in the raising of fowls. The turkey appears to do better in the dry inland districts than on the coast.

Varieties.

The Bronze.—This is the most popular, probably due to its size and hardiness and ranging habits. This habit, however, increases the difficulty of breeding under the confined conditions that have to be used in districts where the fox is troublesome.

The White.—It is claimed by some that the White is the most domestic and the most prolific—a factor of importance in reducing costs of production.

[TO BE CONTINUED.]

Control Schedules for Citrus Pests and Diseases in South-Eastern Queensland.

N. E. H. CALDWELL, M.Sc.Agr., Assistant Research Officer, and F. W. BLACKFORD, M.Sc.Agr., Assistant Research Officer.

IN recent years considerable progress has been made in the study of citrus pests and diseases in Queensland, and it is now possible to make fairly precise recommendations for the control of the majority of these as they occur in the south-eastern portion of the State. These recommendations are here presented in tabulated form as schedules which should enable the orchardist to obtain the required information practically at a glance. He is thus relieved of the necessity for searching through numerous advisory publications for the precise information required.

At the same time, the schedules are not intended to supersede the more comprehensive advisory publications, but are to be used in conjunction with them. A certain degree of flexibility has been admitted in the schedules, particularly with respect to pest and disease complexes and to timing spray applications. These allow for differences between orchards and for variations in seasonal conditions. Thus orchardists must still be able to recognise and assess the importance of the pests and diseases dealt with, and must still use their own judgment to some extent if they are to make the best use of the schedules.

Some citrus growers have been controlling their pests and diseases by programmes differing to a greater or lesser extent from these recommendations. It is not suggested that such orchardists should necessarily abandon their existing practices, but they are strongly advised to examine critically their control operations to see if they are obtaining the best results for their expenditure in this direction.

Two schedules are provided, one for inland areas such as Gayndah and Roma, the other for coastal areas such as Nambour and Burrum. Growers in intermediate districts may use either, provided they realise that as one nears the coast conditions usually become less favourable for fumigation. The schedules are designed primarily for bearing trees—young trees can be treated with considerably more latitude.

In using this table, the grower should attempt to become familiar with the exact pest and disease position in his orchard. He decides which pest or disease is his major concern, and looks for it in the second column of the table in the appropriate yearly period. He then selects the combination of this pest or disease with others listed in column three that most nearly corresponds to the association occurring in his orchard. The treatment for this particular combination is the one that should be used.

Pest and disease control methods used in the orchard are discussed in more detail in other publications issued by the Department of Agriculture and Stock.

SCHEDULE A.—FOR COASTAL AREAS IN SOUTH-EASTERN QUEENSLAND.

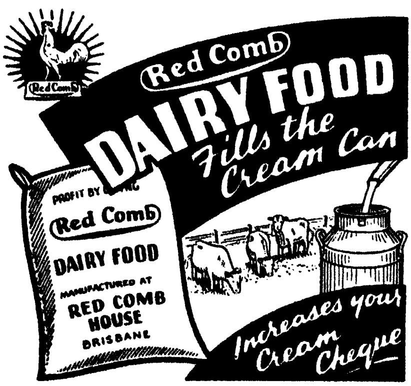
Period.	Dominant Pest or Disease.	Other Pests and Diseases Controlled by Prescribed Treatment.	Treatment.	Varieties.	Time of Application.	Remarks.
LATE WINTER	Maori mite ..	White louse	Lime sulphur (1–15) ..	All	Pre-blossom	This spray also controls lichenous growth and checks bud mite
	White louse	Maori mite	"	"	"	
SPRING ..	Black spot ..	Melanose, brown spot, scab	Cuprous oxide mixture (3–40)	All	½ to ¾ petal fall	Zinc sulphate-lime (4 lb.–2 lb.–40 gal.) for zinc-cured mottle leaf, lead arsenate for grasshoppers, and nicotine sulphate for aphids, may be added to this spray
	Melanose ..	Black spot, brown spot, scab	"	"	"	
	Brown spot ..	Black spot, melanose, scab	"	Emperor of Canton mandarin	"	
	Scab	Black spot, melanose, brown spot	"	Lemons and mandarins	"	
EARLY SUMMER	Black spot ..	(a) Brown spot	Cuprous oxide mixture (3–40)	All	Approximately 8 weeks after spring application of cuprous oxide mixture	
		(b) Pink wax scale, white wax scale, brown spot	Cuprous oxide mixture (honey formula, 3–40) combined with soap-washing soda, soap-washing soda-oil or resin-caustic soda-fish oil	"	Late November to early December	Timing of this spray is determined by scale development, which might necessitate delay until mid-December. Later application would give less efficient disease control
	Brown spot ..	(a) Black spot	As for black spot (a) ..	Emperor of Canton mandarin	As for black spot (a)	
		(b) Pink wax scale, white wax scale, black spot	As for black spot (b) ..	"	As for black spot (b)	
	Pink wax scale	(a) White wax scale ..	Soap-washing soda ..	All	Late November to early December	
		(b) Black spot, brown spot, white wax scale	As for black spot (b) ..	"	"	Brown spot occurs only on the Emperor of Canton mandarin
	White wax scale	(a) Pink wax scale	As for pink wax (a) ..	"	"	
		(b) Black spot, brown spot, pink wax scale	As for black spot (b) ..	"		
MID-SUMMER ..	Maori mite ..	..	Lime sulphur (1–35) or sulphur-lime dust (1–1)	All	Mid-December to mid-January (at least 1 week after early summer spray of cuprous oxide mixture has been used)	Care must be taken to avoid very hot January weather, especially if trees are suffering from drought. The dust is preferable in hot weather

LATE SUMMER TO AUTUMN	Brown spot . .	(a)	Cuprous oxide mixture (3–40)	Emperor of Canton mandarin	Late February	
		(b) Red scale	Cuprous oxide mixture (honey formula, 3–40) with oil	,, ...	Late February to early March	Timing of this spray is determined by scale development, which might necessitate delay until mid-March. Later application would give less efficient disease control
		(c) Pink wax scale	Cuprous oxide mixture (honey formula, 3–40) with soap-washing soda mixture	,, ...	,,	
		(d) Red scale, pink wax scale, white wax scale, mussel scale	Cuprous oxide mixture (honey formula, 3–40) with soap-washing soda-oil or resin-caustic soda-fish oil	,, ...		
	Red scale . .	(a)	Fumigation or oil	Early	Mid-February to early March	In the Maroochy district, weather conditions make fumigation impracticable
				Mid-season and late	March to April	
		(b) Pink wax scale, mussel scale	Fumigation, soap-washing soda-oil or resin-caustic soda-fish oil	Early	Mid-February to early March	
				Mid-season and late	March to April	
		(c) Brown spot	As for brown spot (b) . .	Emperor of Canton mandarin	Late February to early March	
	Pink wax scale	(a) White wax scale . .	Soap-washing soda . .	All	Late March to April	
		(b) Red scale, mussel scale	Fumigation, soap-washing soda-oil or resin-caustic soda-fish oil	,, ...	,,	
		(c) Brown spot	As for brown spot (c) . .	Emperor of Canton mandarin	Late February to early March	
	White wax scale	Pink wax scale, mussel scale	Soap-washing soda-oil or resin-caustic soda-fish oil	All	Late March to April	
	Mussel scale	(a) Red scale, pink wax scale, white wax scale	Fumigation, soap-washing soda-oil or resin-caustic soda-fish oil	,, ...	,,	
		(b) Brown spot, red scale, pink wax scale, white wax scale	As for brown spot (d) . .	Emperor of Canton mandarin	Late February to early March	
	Bronze orange bug	Red scale, pink wax scale, white wax scale, mussel scale	Resin-caustic soda-fish oil . .	All	Late March to April	

SCHEDULE B.—FOR INLAND AREAS IN SOUTH-EASTERN QUEENSLAND.

Period.	Dominant Pest or Disease.	Other Pests and Diseases Controlled by Prescribed Treatment.	Treatment.	Varieties.	Time of Application.	Remarks.
LATE WINTER	Maori mite ..	White louse	Lime sulphur (1–15) ..	All	Pre-blossom	**This spray also controls lichenous growth and checks bud mite**
	White louse	Maori mite	,, ...	,, ...	,,	
SPRING ..	Black spot ..	Melanose, scab	Cuprous oxide mixture (3–40)	All	$\frac{1}{2}$ to $\frac{3}{4}$ petal fall	Zinc sulphate-caustic soda (4lb.–1 lb. 2 oz.–40 gal.) for zinc-cured mottle leaf, lead arsenate for grasshoppers and nicotine sulphate for aphids may be added to this spray.
	Melanose ..	Black spot, scab	,, ...	,, ...	,,	
	Scab	Black spot, melanose ..	,, ...	Lemons, mandarins	,,	
EARLY SUMMER	Larger horned citrus bug	..	Fumigation	Lemons	Late November	Treatment is not necessary if egg parasites are active. Fumigation after the previous cuprous oxide spray is considered safe provided at least 6 inches of rain have fallen. When anticipated low rainfall would prevent fumigation following a spray at a 3–40 strength, a 3–80 strength might be substituted as fumigation may follow such an application after 2 to 3 inches of rain.
	Black spot ..	..	Cuprous oxide mixture (3–40)	Lemons	One week after above fumigation	
				Other varieties ..	Approximately 8 weeks after spring application of cuprous oxide mixture	
MID-SUMMER ..	Maori mite ..	..	Lime sulphur (1–35) or sulphur-lime dust (1–1)	All	Mid-December to mid-January (at least 1 week after early summer spray of cuprous oxide mixture has been used)	This treatment is seldom required when fumigation is planned for late January
	Larger horned citrus bug	Red scale, mussel scale ..	Fumigation	.. .. ..	Late January	*See* remarks re fumigation following cuprous oxide mixture in connection with early summer fumigation
LATE SUMMER TO AUTUMN	Red scale ..	(*a*)	Fumigation or oil	Early	Mid-February to early March	
				Mid-season and late	March to April	Late summer to autumn treatment for scale will rarely be necessary if trees are fumigated for larger horned citrus bug in late January
		(*b*) Mussel scale	Fumigation, soap-washing soda-oil, or resin-caustic soda-fish oil	Early	Mid-February to early March	
				Mid-season and late	March to April	
	Mussel scale	Red scale	Fumigation, soap-washing soda-oil, or resin-caustic soda-fish oil	All	March to April	


PROOF
of
POPULARITY
LAST SEASON
WE SOLD . . .
1,250
TONS
of "HY-PRO"
SUFFICIENT TO FEED
700,000
CHICKS
TO 8 WEEKS OF AGE
SEND FOR
FREE
BOOKLET
NO OTHER FOOD REQUIRED
★ "HY-PRO" is a Complete Chick Food, scientifically balanced to provide all the vitamins essential to quick, sturdy, and sustained growth.
14/6 per 120-lb. Bag
IT COSTS ONLY
SIXPENCE
TO FEED A CHICK TO 8 WEEKS ON HY-PRO
RED COMB HOUSE
ROMA STREET (BOX 743K) BRISBANE
Red Comb
HY-PRO
CHICKEN MEAL
HY-PRO
CHICKEN MASH


Red Comb
DAIRY FOOD
Fills the Cream Can
PROFIT BY
Red Comb
DAIRY FOOD
MANUFACTURED AT
RED COMB
HOUSE
BRISBANE
Increases your Cream Cheque


IT PROMOTES
QUICKER
GROWTH
Red Comb
PIG FOOD
MANUFACTURED AT
RED COMB
HOUSE
BRISBANE
Gives Firmer Flesh

Milk for Cheese Manufacture.

MALCOLM McINTYRE (Chairman Mount Tyson Cheese Factory), E. B. RICE, and L. E. NICHOLS (Dairy Branch).

DAIRY buildings, appointments, and facilities of a reasonable standard are conducive to comfort and greater efficiency in the twice-daily milking routine on a dairy farm, but the limiting factor in the improvement of quality is often the personal equation, which includes the dairy worker's understanding of what constitutes "bacteriological cleanliness" and his wisdom in ensuring it. About 90 per cent. of the deterioration of milk and cream is of bacteriological origin, due chiefly to faults in the cleansing and sterilizing of utensils and the observance of sanitary measures during milking. Clearly, then, a widespread and keener appreciation of the fundamentals of dairy hygiene is of great economic importance.

For over two years instructional work in clean milk production, supported by the scientific testing of milk supplies on receival at factories, has been in progress among suppliers to cheese factories on the Darling Downs. The ability of most producers to profit from the advice given is generally shown by markedly improved quality tests towards the termination of the instructional period. Unfortunately, there is a tendency for some suppliers to revert to less careful methods, a practice which discounts the efforts of conscientious producers.

With the object of fostering uniformity of methods, a dairy shed hygiene chart, chiefly for milk suppliers to cheese factories, has been devised. The aim in its preparation has been simply to cover essentials. The procedures recommended have been thoroughly tried out under ordinary farm conditions for a period of over twelve months on the farm of Mr. Malcolm McIntyre with excellent results, reflected by periodical quality tests made on the milk supplied to the factory. It can be safely asserted that by the consistent application of these tests, the production of milk which will produce cheese of good commercial quality is assured. Even by a partial application only on a mass scale by the suppliers to the Mount Tyson cheese factory, excellent results have been achieved, as reflected by the following official gradings for the cheese output during the period, April, 1940, to January, 1941, inclusive:—

	Per cent.
Choice grade	91
First grade	9
Second grade	Nil

The regular and systematic examination (say weekly) of milk by the methylene blue test should be a corollary to the use of the chart amongst suppliers, for an unsatisfactory test will indicate to a producer that there is some weakness in his methods and then by reference to the chart he will be in a position to ascertain the fault and take steps to rectify it forthwith.

Extensive field experience has shown that the accuracy of the modified methylene blue test in revealing a satisfactory milk for cheese making is so closely allied to the Wisconsin curd test and subsequent cheese quality that it warrants general application for educative purposes, and as a standard milk grading test at all cheese factories.

The technique has been prepared primarily for milk suppliers to cheese factories, but with slight modification would be suitable for suppliers of cream to a butter factory, as similar general principles apply in each case. The chief additional points which require attention by cream suppliers are:—

1. *Separator Parts.*—Completely dismantle all parts twice daily. Thoroughly cleanse and scald or sterilize with steam. The separator parts should be steam sterilized for at least two minutes by placing them, with any other small pieces of equipment, under the milk vat and preferably on a well-drained metal stand. Finally, the utensils should be placed on an approved metal draining rack away from yard dust; if desired, the draining rack may be in the sun.

2. *Cooling of Cream.*—The use of a tubular metal cooler, through which water is circulated, followed by trough cooling in a concrete cooling trough in a dairy is advised.

3. *Cream Blending.*—Proper blending of cream from different milkings is important. Do not mix hot cream with the cool cream from a previous separation until the animal heat has been withdrawn.

4. *Stirring Cream.*—Stir the cream from time to time while it is held in the dairy.

Dairy Shed Methods Chart.

(1) Care should be taken to see that all cows in the herd are in a sound, healthy condition.

(2) Milk should not be supplied to the factory until ten (10) days after calving.

Milking procedures to be carried out during the night's milking operations.

(3) Flush out milking machines, milk cans, and all utensils with cold water drawn from the sterilizer, to which an approved quantity of "chlorine compound" has been added, before commencing milking operations.

(4) Wash cows' teats and wipe well. Check carefully each teat, to make sure that milk is normal, before putting on the machines.

(5) Water for washing teats should be drawn from the sterilizer and chlorine compound added in quantities recommended by the makers. Change water frequently when dirty.

(6) After use, teat cloths should be thoroughly washed, then treated with boiling water from the sterilzer, and effectively steamed with the utensils and hung out to dry.

(7) After removal of machines, strip cows thoroughly. Aim to practise dry milking. Milker's hands should be kept in a clean condition. A dish, soap, and towel to be provided for this purpose.

(8) After completion of milking at night, flush out machines first with cold water (drawn from the sterilizer before firing it) followed by hot water to which an approved quantity of cleanser has been added, and finally boiling water drawn from the sterilizer. In each case use not less than one (1) gallon water per unit. Lift unit up and down in water to permit of thorough flushing.

(9) Thoroughly wash all utensils with fairly hot water to which cleanser has been added; then finally scald.

Procedures to be carried out after the morning's milking.

(10) After completion of milking in the morning, flush out machines first with cold water (drawn from the sterilizer before firing) followed by hot water to which an approved quantity of cleanser has been added, and lastly boiling water drawn from the sterilizer, using in each case not less than one (1) gallon of water per unit. Then thoroughly steam milk pipe line after having first drawn through it a brush or rolled up bundle of horse hair.

(11) Thoroughly wash teat cup assemblies, and all utensils in fairly hot water with cleanser added, followed by effective steaming of all parts (each set of teat cups to be steamed separately). Store all utensils in the sun during the day, in a place as far as possible free from dust contamination.

(12) Machines should be dismantled and thoroughly cleaned and sterilized regularly.

(13) Air lines should be flushed out and effectively steamed at least once a week.

Milk Treatment.

(14) Milk should be passed over an approved cooler or aerator night and morning and strained through wad filters. Night's milk should be distributed in half cans and left in an approved milk stand over night. Milk should be stirred after milking and again later, using a standard milk stirrer.

(15) Night's and morning's milk should not be mixed before delivery to the factory.

(16) Milking should be completed as early as possible in the mornings and milk delivered promptly—being protected during transit with a regulation canvas can cover.

(17) Milk cans should be washed promptly on arriving back from the factory. In no case should this work be left over until later in the day.

Method of Washing Cans.

(18) First rinse cans with ample cold water to remove surplus whey. Wash thoroughly both inside and outside with fairly hot water drawn from sterilizer with cleanser added. Follow this by a scalding rinse to remove cleanser. Finally, steam sterilize each can for two (2) minutes. Cans should be stored upside down on a draining rack (preferably one constructed of galvanised piping) away from yard dust pollution; this rack may be in a sunny position, if preferred.

(19) Eliminate the use of wash-up cloths in the dairy cleansing. Good quality brushes should be used, and sterilized daily after use.

(20) Care should be taken to see that milk cans and all utensils, especially the rubber-ware used in the machines, are kept in good repair. Renewals should be made promptly where necessary.

(21) Bail floors should be washed daily. Manure should be removed from yard daily and efforts made to abate dust nuisance.

Myoporum acuminatum (Strychnine Bush).*

A PLANT POISONOUS TO STOCK.

JOHN LEGG, D.V.Sc., B.Sc., M.R.C.V.S., Senior Veterinary Officer, and
C. T. WHITE, Government Botanist.

THIS is a plant with a wide distribution in Australia, and from our knowledge of the plant, the term may include more than one species because the plant is of variable appearance. It is a shrub 4 to 6 feet in height—or a small tree—with glossy green leaves, which are bitter when chewed. It has small white flowers and the fruit is globular, about ¼ inch in dameter, and purple in colour when ripe. Because of the bitter taste of the leaves it is rarely eaten by stock. (See Plate 26.)

Plate 26.
STRYCHNINE BUSH (*Myoporum acuminatum*).

It is known by the name of "strychnine bush" and is a close relation of the Ellangowan Poison Bush (M. deserti) of Western Queensland, which is known to be a serious poison plant.

* Contribution No. 13 from the Poison Plants Committee, Department of Agriculture and Stock, Queensland, established as the result of a grant from the Australian Wool Board for the purpose of conducting investigations with plants suspected of being poisonous to stock.

It has been suspected several times in Queensland as being poisonous, and recently the stock inspector at Biggenden (Mr. Sigley) drew our attention to stock losses which were occurring in his district in areas where the plant was growing profusely. At the time the losses occurred, drought conditions prevailed and feed was scarce in the district and there was some evidence that the cattle were eating this plant. Not being able to determine the cause of the mortality from an examination of the animals which had died and which presented certain characteristic changes, such as congestion of the lungs, it was decided to carry out experiments to determine whether the plant was poisonous or otherwise.

For this purpose plants were sent to the Animal Health Station, Yeerongpilly, and feeding experiments were performed on sheep. These experiments were carried out by making the animals ingest a small quantity of the plant each day.

As a result it was found that amounts even as small as 1 lb. were quite sufficient to cause death in sheep. At the same time the characteristic changes, such as congestion of the lungs, &c., which were noted to occur in natural cases in cattle, were also produced in sheep.

MAN'S NEVER-ENDING WAR AGAINST INSECT PESTS.

Man's war against insect pests is never-ending. Is it a question of the survival of the fittest, we wonder? If it is, the argument is in favour of the insect. The cockroach, for instance, was, we are told, on this earth a million years before man made his appearance; therefore, it is likely to be here a million years after man has joined the moa and the mastodon. The cockroach came with the Coal Age. Its first home was in Asia; it travelled by ship to Holland, and later settled all over Europe. As the cockroach migrated all over the world, so with other insects. In Queensland almost every pest of sugar-cane has been imported. On the other hand, the entire Hawaiian cane crop was once threatened by the Australian cane-leaf hopper. These pests, of course, have their natural enemies—just as well for us!—but that's no reason why we should allow ourselves to be lulled into a false sense of security. The fact remains that only in a comparatively few cases have we won the battle against the bug. The job of keeping insect pests in check is a permanent job in which we cannot afford to let up. The importance, then, of every farmer co-operating whole-heartedly in every measure of pest control cannot be over-emphasised. Regarded rationally, the question of insect pest control is actually a matter of man's survival on this planet.

Soil Erosion.*

By H. W. KERR.

THE earth's fertile soil has been truly described as a capital asset which man, by his activity, can preserve, augment, or destroy; and the preservation of this fertility must be the foremost aim of every true agriculturist—it is the very foundation of any permanent agricultural structure.

The farmer who produces his crops under conditions of tropical temperatures and rainfall knows only too well the difficulties which attend any attempt to observe this dictum. These are conditions which promote the highest degree of activity of soil organisms, which quickly destroy crop residues and operate against the accumulation of soil humus. The ready release of plant foods in this way proves most beneficial to the growing crop, but the heavy rains of the wet season lead to the rapid removal of these foods by leaching, unless the crop roots are first able to absorb them.

These facts have been clearly appreciated by thinking farmers and soil scientists for a long time; but it is only of recent years that it has come to be realised generally that the fabulous fertility of tropical soils is a mere figment of the popular imagination; and that, though sometimes rich at first, they have not the ability to retain their riches which are very often dissipated at an astonishing rate.

So we understand why our cane growers of the wet tropics must devote so much attention to liming, to the purchase of artificial manures, and to those other practices which make for the conservation of a productive soil. They are merely waging war with the prodigality of nature, brought about when man upsets the delicate balance which exists between soil and vegetation on the virgin lands. But there is sometimes created in addition a set of conditions which leads to a tenfold acceleration of even this speedy process of fertility depletion. Not only is the plant food drained away by leaching, but the soil itself is removed as a body; and where this process has gone on to any pronounced degree, man is powerless to call a halt. As President Theodore Roosevelt once said: "When the soil goes, man goes, too."

The process known as soil erosion has been aptly described as the "tragedy of the death of soil fertility." Though it is only recently that many Australian farmers have become aware of the existence of this menace, it is not by any means an occurrence solely of modern times. The remains of old civilisations like those of Mesopotamia, Greece, and Northern Africa doubtless came as a result of the degradation of fertile soils which led to the formation of desert; and at the present time overstocking in Africa, due to so-called "modern" advances in knowledge, is creating its own problem in this continent, which is probably the most severe sufferer from erosion.

But perhaps the world's outstanding example of erosion damage is supplied by China. On the rich alluvial lands of that country cultivation has proceeded unimpaired by erosion. This has been possible due to the care of the farmers to return organic refuse, and in other ways

* Address delivered at Meringa Sugar Experiment Station, at the joint Field Day and Sugar Technologists' Agricultural Session, 19th April, 1941, and reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1941.

minister to the needs of the land. On the slopes, however, wide areas of loessial soil have been completely denuded and ruined by washing, over many centuries. Attempts to stem the losses, by terracing, have merely slowed down the process, and erosion still goes on.

Position in U.S.A.

In the United States of America the destruction of fertile lands by wind and water erosion provides what is probably the major problem which that country now faces; and all this has been brought about in a mere century or so, by ill-guided agricultural systems which did not observe the necessity for soil preservation. Originally, only some 2½ per cent. of the land area was classed as desert, but in the course of two or three generations nearly one-half of the forests have been cleared, and a large part of the prairies, from the Rockies east, has been brought under the plough. Retribution has been astonishingly swift. Recent surveys showed that 10 per cent. of the total land area of the United States has lost more than three-quarters of its topsoil, 30 per cent. has been moderately eroded, and 4 per cent. has had most of its topsoil blown away by dust storms.

Coming nearer home, we find that over-grazing in South Australia has destroyed the vegetation and wind erosion has commenced its work. In New South Wales, Victoria, and even on our own Darling Downs water erosion is leaving its mark, and Governments are grappling with this preventable problem. For man must realise that he cannot be a parasite on the land; he must enter into partnership with the soil—giving as well as receiving; and the results of efforts to control this menace will determine the future of soil fertility.

Causes.

A careful study of causes may reveal the steps to be taken to prevent the trouble, for it is everywhere recognised that this is definitely a trouble where prevention is both simpler as well as more effective than cure. As water erosion alone concerns us in the sugar districts, attention will be confined to this phase of the problem.

It is a significant fact that erosion effects are generally much more prevalent in regions of moderate rainfall than they are in districts of very heavy precipitation. But one point must be clearly appreciated—erosion does not occur under conditions of natural jungle or forest cover. To make this statement is but to emphasise a truism; for otherwise the soil we find there could not have become established and developed to a state of maturity. Certainly geological processes lead to the gradual removal of, chiefly, exhausted material which has made its contribution to the fertility of the soil; but this takes place only at a speed equal to that of the process of soil formation. Sometimes the depth of soil extends to many feet, while at others it may only be a few inches. But this equilibrium is easily disturbed by man. Removal of the vegetative cover, unless this be done with due regard to all the consequences, and the influence of subsequent cultivation processes may so accelerate the denudation of the land that the result is disastrous. The amount of soil which takes a century to grow and accumulate may be swept away in a year—or even by a single storm. The problem involves, of course, the question of soil fertility in its broadest sense. It is not merely one of plant food supply, but the question of soil stability is intimately involved. When the soil becomes exhausted it becomes unstable, and is then moved bodily.

Vegetation's Aid.

We recognise then that the vegetation plays an all-important part in the preservation of the land. It protects the soil from the erosive effects of wind and rain. The loss of fertility and humus brought about by cropping or cultivation may possibly be made good by the use of fertilizers and the preservation of plant residues; but even these must fail if the agricultural system does not produce equivalent physical effects on the soil as did the natural vegetation. The deterioration of these factors provides the prelude for actual erosion. Very frequently a change of climate is blamed for a falling off in crops; but it is the land which has changed. The unstable soil is first removed by sheet erosion, and because this is not readily perceptible it often passes unrecognised. Later, small gullies become evident, and these rapidly grow until the land surface is heavily scarred and defaced. When this stage has been reached only drastic remedial steps possess any chance of success.

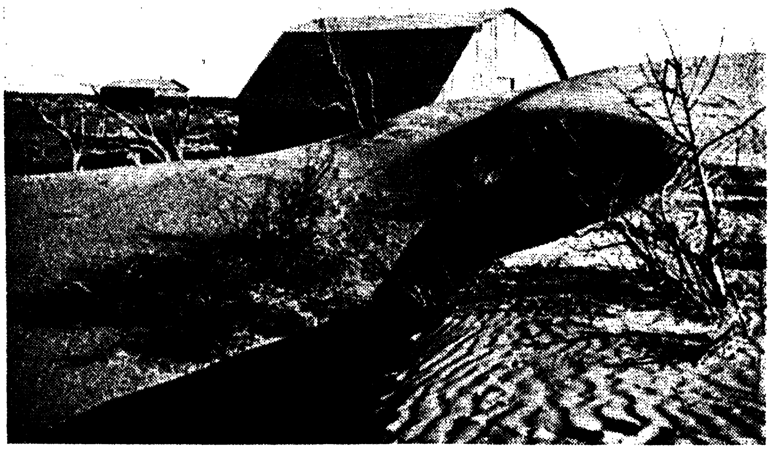


Plate 27.
SHOWING HOW ADVANCING SOIL, BLOWN BY THE WIND, IS WIPING OUT FARMS AND BUILDINGS IN U.S.A.

Extensive and intensive studies of erosion causes have been made in the United States, and are proceeding. It has been found that the cultivation of land with greater than 8 per cent. slope gives such heavy losses of topsoil that it should be kept under permanent grass. In other words, it is virtually impossible to preserve such land if it be cultivated at all. An interesting study carried out in Oklahoma showed that whereas land under grass lost soil annually at the rate of only 0·04 tons per acre, a similar field planted to cotton lost 39 tons per acre. These facts have been repeatedly demonstrated.

Of interest to cane growers should be the finding that continuous one-crop cultivation on slopes has been one of the most serious factors contributing to erosion losses. Cotton and maize are the chief offenders in that country. In Iowa it was found that even slight slopes in corn areas were losing topsoil at the rate of 60 tons per acre. Doubtless parallel conditions could be found in parts of the Queensland sugar

cane belt. Very often the moderate hillside slopes which are cultivated in areas, such as Innisfail and Childers, carry a deep red volcanic soil; and because of the almost imperceptible change in colour and texture from topsoil to subsoil, the loss of even a foot or more of the valuable surface layer may pass unnoticed. But evidence is readily to be found in the depleted productive capacity of the land, and oft-times in the fences or walls at the bottom of the slopes against which is piled much of the eroded fertile soil from the hilltop.

Plate 28.
SHOWING HOW GULLY EROSION DEVELOPS FROM SHEET EROSION.

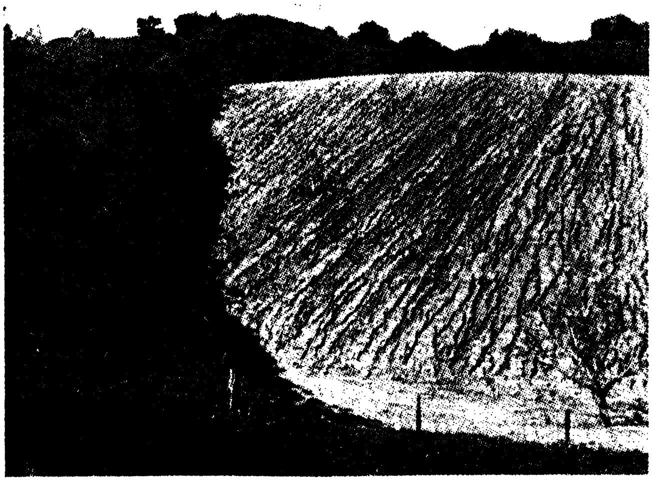


Plate 29.
SHOWING THE INFLUENCE OF VEGETATIVE COVER.—The bare land (*right*) lost 500 tons of topsoil per acre, from a single storm; the protected land (*left*) practically none.

Prevention.

As with all diseases, the prevention of soil erosion is better than the cure; and it should be the duty of every farmer cultivating sloping lands to appreciate the several factors which contribute to the causes of erosion and to adopt those measures which will avoid its occurrence.

It is a happy circumstance that most of our best cane lands are alluvial in character and are thus not seriously subjected to this menace. However, where hillside slopes are cultivated for cane, the trouble is likely to be severely exaggerated. Firstly, the cane grower is usually a one-crop farmer; secondly, he is required to confine crop production to that area which is assigned for the purpose, and the regulations under which he operates enable him to harvest virtually 75 per cent. of this area annually. Finally, cane assignments have naturally been granted without any thought of the dangers of erosion damage. Such a combination of circumstances may therefore be very harmful. We have already indicated the menace of one-crop farming, and the period of rest which such land normally enjoys is a mere three to six months in, say, four years. This provides barely time for the growing of a leguminous cover crop, which, though definitely of great value, can scarcely be regarded as constituting a rotation system.

Plate 30.
SHOWING EXTENSIVE GULLY EROSION IN A BABINDA CANEFIELD.

Communal Problem.

There is abundant evidence to demonstrate that the erosion problem is not simply an individual matter; it is essentially communal in character, and obviously requires the attention and close supervision of a governing authority, whose duty it is both to educate the community in the accomplishment of its aims and in laying down the principles which must be rigorously enforced if necessity arises.

It is not possible, in the scope of this brief address, to do anything more than formulate the major guiding principles which have been established. The problem, as we have seen, is to prevent, retard, or regulate the removal of run-off water from the land surface, so that disturbance of the soil will not occur. To promote the maximum absorption of rain water, the soil should be maintained in a condition similar to that of the virgin land. Most cane growers should vividly appreciate

what this involves; it requires the maximum effort in conserving or building up humus, which is probably the most important single factor contributing to the retention at all times of an absorptive soil. Cultivation methods should be adopted with care, and intelligence applied in their performance. Though cultivation is good for the crop we have stressed repeatedly that it is bad for the soil; and though it is employed to offset the forces which tend to consolidate the land and destroy its tilth it in itself is a prime factor in breaking down the desirable "crumb" structure of the soil, and in the production of hard pans which seriously obstruct the ready uptake and percolation of water in the soil. It has been demonstrated under a range of conditions that erosion losses have been maintained at their lowest level where hillsides can be cropped without recourse to work with implements. Deep grubbing is the most desirable operation on hillsides, if cultivation must be done, as it can be employed to open up the soil to the greatest depth while breaking down the ill-effects of surface tillage implements.

Plate 31.
Illustrating the Commencement of a Headland Gully on a Tully Farm.

In spite of everything that might be done to promote the most complete absorption of rainfall, there will always occur deluges which would seriously overtax the absorptive power of even a deep sandy loam. The complete prevention of run-off is thus impossible. Provision must therefore be made to take away the water in such a manner that the soil is not damaged in the process.

One relatively simple expedient for holding moderate amounts of run-off water is the use of contour furrows, the soil from which provides low ridges extending across the slope at suitable intervals. These trap the run-off water from above and hold it until it can be absorbed. This system is found most useful with non-cultivated crops such as grass, but it fails in its purpose, and may even aggravate the damage if the furrow becomes speedily filled and overflows; the position may be disastrous if this should happen before the ridge becomes consolidated and protected.

Make Terraces.

The most successful plan under such conditions is the construction of terraces. Briefly, this consists in converting the slope into a succession of wide, practically level benches, with a short, though steeper drop from one terrace to the next below. More complete details of terrace construction will be found in the chapter of the "Cane Growers' Handbook" devoted to this subject. This plan assures the maximum opportunity for the absorption of the rainfall on the flat surface, while the slope, though steep, is so short that the water flowing down it does not attain such a speed as to cause the removal of much soil to the terrace below.

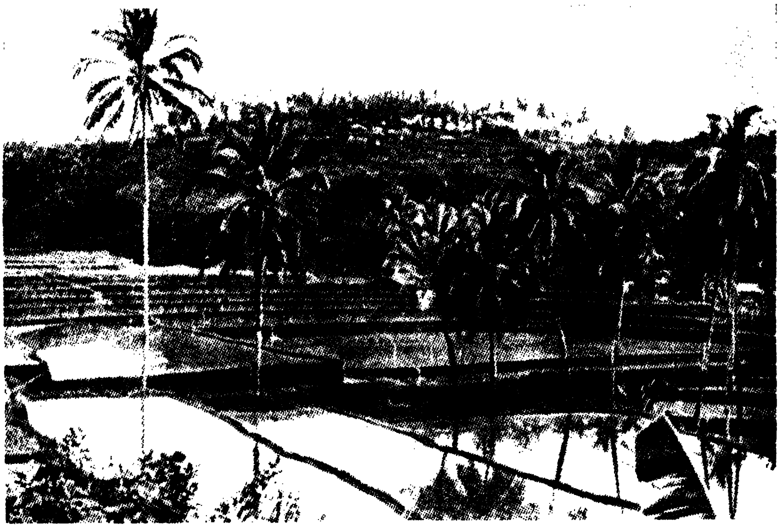


Plate 32.
SHOWING THE TERRACING FOR RICE CULTURE, WHICH IS A FEATURE OF HILLSIDES IN THE EAST INDIAN ISLANDS.

Precautions, of course, must be taken to provide for the removal of excessive water and its conduction to natural drainage courses at the lower levels. The terraces are therefore given a slight slope, usually from the centre to both sides, of the order of 6 inches per 100 feet. Further, the terrace usually has a slight slope backwards from its outer edge, to avoid the stream cascading down the slope. Finally, the terrace should terminate in a well-defined gully, which serves to take care of inevitable run-off; these gullies are protected against erosion by grassing, by the installation of stone, wooden, or even earthen dams, or by the use of any other obstruction which will check the velocity of the water.

We have no knowledge of the adoption of the terrace system in the sugar areas of Queensland; but farmers on gentle slopes are urged to give this plan their serious consideration. When properly constructed, terraces offer no problem to the use of cultural implements, as the usual methods can be carried out without any heed to their existence.

One or two points are most important in attempting any earth sculptural methods such as those just discussed. Firstly, earth ridges or terraces are most vulnerable just after they have been built, when the soil is loose and incoherent. They should therefore be constructed at such times as heavy downpours are most improbable. They thus have

a chance of becoming firmed and bound together before they are tested by flood rains of the wet season. Secondly, the job should always be commenced at the top of the slope and never at the bottom. Many farmers choose to spread the work over successive seasons, so that only a proportion of the terraces or furrows is liable to washing at any one time, in the critical period which precedes consolidation of the soil.

Plate 33.

Contour Banks such as these are Effective in Controlling Slight Slopes.

Plate 34.

Showing the Simplest Method of Combating Sheet Erosion: Strip-cropping with Alternate Strips of Different Crops.

Cane Growers' Advantage.

There is one important respect in which the cane grower possesses a distinct advantage over other farmers cultivating slopes. He has not to plough out each year, after the crop is harvested, while the trash and tops are available to assist in erosion control. The value of the latter

factor is not at all well appreciated under these conditions. Its conservation provides a mulch which controls weeds and eliminates excessive cultivation. When compacted by rain it offers strong resistance to removal by running water; it thus checks the velocity of flow in much the same way as the leaf mould, roots, &c., did on the virgin land; while the water which is shed flows rather from the trash than from the soil, and the latter is thus protected. Finally, it leads to increased soil fertility, and an improved physical condition in the land, which make for successful ratooning, and the less frequently such areas require to be disturbed by ploughing, the better for the soil and its safety. Many northern growers object to this policy, because they claim it leads to increased borer damage to the crop; but our entomologists have made it clear that this occurs chiefly when a few well-recognised precautions have not been taken. It is admitted, however, that for hillside conditions, a hardier cane variety with a strong rooting system and ratooning capacity is definitely needed. This is a responsibility which our plant-breeder will not overlook.

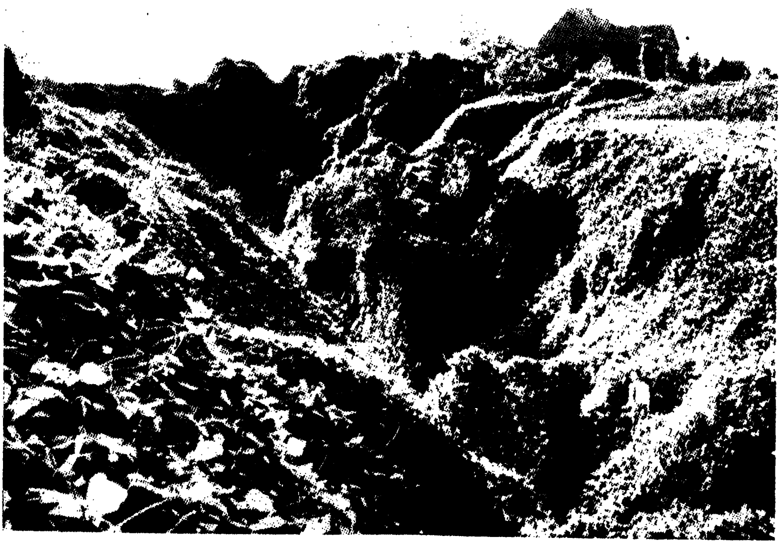


Plate 35.
ILLUSTRATING THE USE OF A LEGUMINOUS VINE (KUDZU) IN PROTECTING GULLIES AGAINST FURTHER EROSION.

I might also make reference at this time to the plan of "strip" or "contour farming" which many farmers have adopted overseas as a means of minimising erosion damage. When it was recognised that the cultivated crop is the worst offender, a plan was devised for laying out the farm in narrow strips running at right angles to the slope, with alternating cultivated and non-cultivated crops in the successive strips. Any tendency to excessive erosion is thus checked when the running water encounters the area of grass or other non-cultivated crop; its velocity falls, and the load of sediment which it may carry is largely deposited once more. Though this does not eliminate erosion, it certainly guards against serious loss of soil from the farm.

This scheme may have limited application in the cane areas; but it should not be overlooked and may prove very useful in those places

where standover cane is grown. A strip of cane which is to stand until the following year will provide useful assistance in preventing serious erosion losses from the immediately adjacent cultivated fields above and below it. In more serious circumstances it might be well worth while interposing narrow fields of some permanent grassland between cane-fields, and after a period of years changing over from cane to grass and from grass to cane.

Perhaps further points of interest will be brought out in our subsequent discussion; but I would like, in closing, to stress that the land of this great continent is merely held in trust by the individual, for future generations; the robber agriculturist must therefore be eliminated and soil exploitation prevented.

Mr. Bulcock's Address.

In opening the discussion, Mr. Bulcock delivered an interesting address on his overseas experiences in connection with soil erosion. He stressed the severe and lasting effects of soil erosion on the land and said that in Australia we are not as yet face to face with this problem in its most serious form. The effects have been most apparent in countries which have been practising agriculture for many years. Serious erosion in South Africa was chiefly the result of overstocking. In the United States of America most interesting phases of erosion were apparent. Control methods employed there were much more comprehensive than in any other country and involved as a first angle of approach the prevention of further erosion. This involved contour furrowing and terracing. He had been assured that terracing had had a beneficial effect quite apart from the erosion control aspect, resulting in a 47 per cent. increase in productivity in one case which he quoted. Mr. Bulcock described the method of treatment for gullies by the provision of a dam at the lowest point, thus causing a deposition of soil; this practice had given remarkable achievements in restoring land to its previous levels.

It was suggested by Mr. Bulcock that prevention measures be taken here where it was considered desirable. He believed a soil erosion consciousness would be created in this State, and he felt sure that the co-operation of those vitally concerned would be readily forthcoming. He considered that vegetation constituted the most efficient method of protection. He stressed that attention should be devoted to the preservation of trees, the provision of belts of trees, the preservation of grass lands and the vegetation of creek beds, and the desirability of a shallow finish at the end of the ploughing of the field. He thanked the chairman for the opportunity of addressing the gathering on this subject.

Value of Sugar as Feed for Stock.

HITHERTO the Queensland sugar grower and manufacturer has had only one serious obstruction to the disposal of his entire production—that of unprofitable price: but the present disturbed world situation has introduced the difficulty of crop marketing, and there exists a distinct possibility that some cane crops may in the near future be left unharvested. This raises the two-fold question which is engaging the attention of all thinking cane farmers—what can be done with excess production and to what purpose can spare land be put to supplement the farm income?

In this respect there is something of interest in an article published in a recent issue of "The Philippine Agriculturist." It records the results of a pig-feeding trial conducted at the College of Agriculture, in which raw sugar was incorporated in the ration of two of three groups of animals. The feed formulæ employed were varied somewhat with the age of the pigs, but at all times a constant relationship was maintained between the corn and sugar utilized. The average percentage of these constituents were—

	Lot. 1. Per cent.	Lot. 2. Per cent.	Lot. 3. Per cent.
Corn	25	12·5	nil
Sugar	nil	12·5	25

The feeding trials extended over a period of 210 days. The animals were fed their ration twice daily, and at other times were allowed to run in the paddock. They were weighed weekly.

The results show that the pigs which were given half-and-half corn and sugar (Lot 2) recorded the most rapid gain in weight throughout. The difference between the remaining lots was of no significance. It was actually found that the mixture was 14 per cent. superior to either maize or sugar. On the basis of the figures presented, it is concluded that with corn at £9 per ton (4s. 6d. per bushel) sugar was only slightly more expensive as feed when priced at £15 per ton! It is suggested also that sugar could be used profitably, in competition with maize alone, if the price of the sugar did not exceed £13 per ton.

While it is not proposed that raw sugar should be manufactured for this purpose in Queensland, these data are certainly arresting. They do indicate, at least, that the sugar cane crop may have a value as supplementary pig (and, perhaps, other stock) feed. It has been reported by a prominent cane grower in Southern Queensland that he has had experience of turning brood sows on a plot of standover Co.290. The animals made an excellent job of cleaning up the field and actually completed the first step in preparing the field for replanting. If the pigs thus harvest their own fodder little or no cost is involved in this method of crop disposal. Doubtless much of the juice from the cane would be lost in the process, but this could be avoided if the farmer would harvest and chaff the cane. Cane alone cannot, of course, be regarded as a satisfactory sole feed for growing pigs; however, it is evident that at least 25 per cent. of the ration might be made up in terms of the sugars of the juice.

—H.W.K. in *The Cane Growers' Quarterly Bulletin* for April, 1941.

Influence of Wind on Plant Growth.

IT has been pointed out that in regions of strong winds, the growth of sugar cane in the outer rows is markedly affected by this adverse condition. Such a state of affairs existed at the Bundaberg Station before the southern boundary of the farm was protected by a giant privet hedge. This hedge has developed to such an extent that the depressed cane growth on the outer margin of the adjacent block has now disappeared.

Similar evidence of wind effects is demonstrated in a remarkable manner in the accompanying picture (Plate 36).

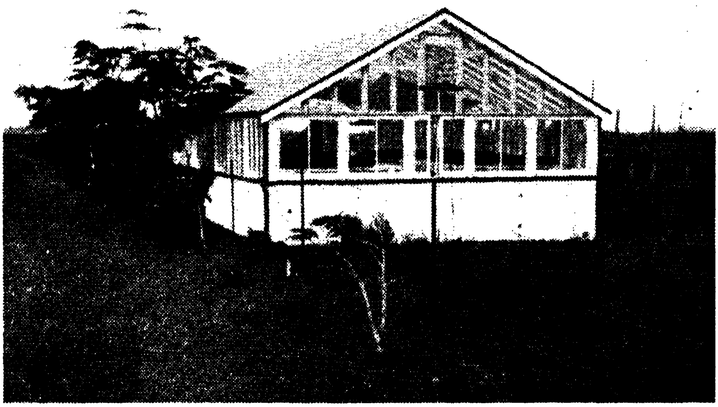


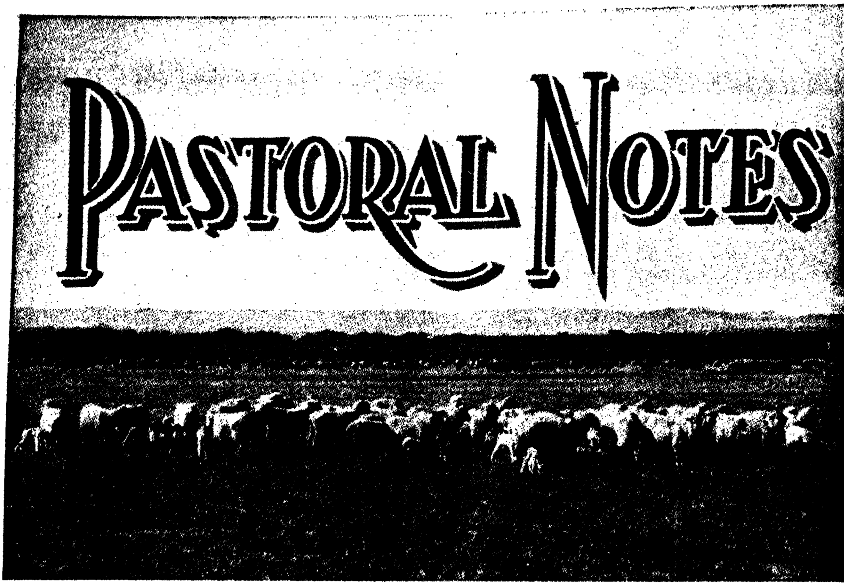
Plate 36.

Illustrating the Effect of Wind Protection on Growth of Poinciana Trees: Note Stunted Specimens in the Foreground.

A row of poinciana trees was planted on the Mackay Sugar Experiment Station a few years ago. They were in an exposed position, and made very poor progress. About two years ago, the seedling hothouse was built, and the three trees which were given protection from the south-easterly wind by the structure immediately made normal development. The two remaining trees in the foreground (*see* Plate 36) have retained their straggly, unthrifty appearance, and this is attributable to the strong wind effects to which they are exposed.

These facts should suggest to farmers the desirability of providing tree growth about the farm in such a way as to break strong winds. Not only does it provide useful shade for animals and enhance the appearance of the property, but it returns dividends in improved crop growth.

—H.W.K. in *The Cane Growers' Quarterly Bulletin* for July, 1941.



Sheep for Small Holdings.

SHEEP should have a permanent place on any farm on which conditions are suitable. One of the advantages of sheep is that they provide two distinct sources of income annually—wool and mutton—besides their natural increase.

In Queensland, merino sheep constitutes about 97 per cent. of our total number. This breed is especially adapted to conditions in the Central and Western districts of the State, but when forced to breed and develop in an unsuitable environment, constitutional weakness is a real risk.

British breeds have been developed and maintained under conditions where environment has influenced adaptability to Queensland conditions. In mixed farming districts these breeds—especially the pure-bred rams—can be used with advantage. The Corriedale originated in New Zealand, and the improvement of the breed has been progressive both there and in Australia. In Queensland, the Corriedale is regarded as a dual-purpose sheep coming between the merino and pure British breeds, overlapping both in adaptability to a considerable degree.

In sheep breeding, local conditions should decide the system of production.

Sheep breeding under diversified farming conditions where the British breeds are used is entirely different from merino breeding in the West. The merino is bred under purely pastoral conditions, and the progeny is retained for wool and mutton production. With the imported mutton breeds, the aim of the farmer is to dispose of the progeny at the earliest marketable age. To do this successfully, two major points should be observed:—

(1) The use of pure-bred rams of quick-maturing qualities suitable to location and conditions.

(2) Availability of suitable pasture or cultivated crops for ewes as soon as their lambs are dropped, and for topping off the lambs.

Other considerations of importance are the suitability of the ewe flock for wool production as well as for breeding; economy in pasturing the ewe flock from the time the lambs are taken off until the next drop of lambs; the general health of the flock and freedom from parasites, fodder provision for carrying the flock successfully through periods of scarcity; and culling of the breeding flock for age while they are still capable of being fattened and sold at a profit. To start successfully in breeding, whether for wool, mutton, or for fat lambs, healthy sheep are essential. This may mean paying more for young sheep, but it will generally prove the best and safest policy.

CATTLE FATTENING.

There are large tracts of well-grassed land in South-eastern Queensland on which fattening of bought store cattle is practised. These cattle are usually animals which fatten into "heavies." Older stock can "handle" roughage much better than yearlings, and it takes less time and trouble to get them ready for market; but, in general, they do not give as good a net return as "baby beef."

The reasons are:—

(1) Buying of stores is a more speculative business and the outlay greater.

(2) Disease, drought, and other retarding influences make the money loss, if any, greater.

(3) The trade does not favour "heavies."

(4) Although the relative cost per 100 lb. is higher with the "young stuff," more can be bought for the same money.

(5) The young animal lays on both flesh and fat—i.e., it fattens while it grows.

(6) The trade pays more for the finished carcase.

(7) There is *always* a market for well finished lightweights.

There are certain requisites for turning off baby beeves the year round:—

(1) On the part of the buyer, a sound knowledge of what "good doers" like;

(2) On the property—well-planned subdivision, improved pastures, cultivation, and fodder conservation.

Improvements require a considerable outlay of capital, but in all cases where management has been sound the returns have made it well worth while.

It should always be remembered that the improvements are permanent, and that they enhance the value of the property.

MERINO TYPES FOR COUNTRY AND CONDITIONS.

In merino sheep it is not always advisable, or even possible, to breed the type one would wish. To be successful, a farmer should realise that the type should be chosen to suit his country and local conditions. For instance, it should be obvious that the sheep carrying the clothing wools of Western Victoria would prove a failure in the western districts of Queensland.

In selecting a type, the first consideration should be constitution. In the West sheep frequently have comparatively long distances to go to water. A sheep then should be introduced that is fitted by nature to withstand this hardship. Judged from a financial point of view—and, after all, everything practical in the industry comes back to a matter of pounds, shillings, and pence—consideration should be given to the type of animal which gives the yield per head rather than price per lb.

Having evolved a type suitable to his particular conditions, it is important that the farmer should stick to the stud supplying the rams. It takes a man of experience in breeding to successfully maintain a flock while chopping and changing about from stud to stud.

Pay the price for the better-type rams and, if necessary, pay the right man to select them, having regard to the type of ewes with which they are to be mated.

LAMB MARKING.

For lamb marking all instruments should be sterilized. Tetanus is always a risk in old yards and sheds. If the work can be done in grassed yards the risk of the entry of tetanus and other germs is reduced considerably. On large holdings it is always advisable, when practicable, to do the work in the breeding paddock, where temporary dust-free yards can be erected.

Marking should be done in early morning or late afternoon, and the sheep should be released as soon after as possible, to avoid any risk from germ-laden dust. The correct age for marking is from two to four weeks. Care should be taken to sever the tail at a joint. An antiseptic dressing should be applied.

LOCKJAW IN HORSES.

From time to time valuable horses die from tetanus (lockjaw), and, in some instances, early attention might mean the saving of the animals. The financial loss to the owner is serious, especially when the loss is not covered by insurance. The loss in the case of the death of a valuable draught or thoroughbred stallion is a matter of community as well as of individual concern.

Once tetanus develops and symptoms become evident, it is almost impossible to save an animal. The symptoms are dilated nostrils, head poked forward and neck stiff, movements slow and hesitant, tail elevated and held straight out, and the third eyelid (haw) swinging backwards and forwards across the eye at the slightest noise. Clapping of the hands or opening of the stable door may produce the lastmentioned symptoms. In short, the animal appears stiff all over, is unable to bend the body normally, and is described as "swinging about in one piece like a ship at sea."

In horses, tetanus usually occurs as a result of some small injury, such as a punctured wound in the foot or any other part of the body. Stable manure is a most suitable medium for tetanus germs.

The incubation period in most cases, especially in horses, is one to two weeks. However, cases have occurred where symptoms have been observed twenty-four hours after infection. Preventive measures should always be adopted by thoroughly cleansing the wound and treating it with tincture of iodine or some other antiseptic. In cases of punctured sole or bruises, after cleansing the wound thoroughly and treating it with antiseptic dressings, plug the wound with tow soaked in tincture of iodine and bandage the foot to prevent the entrance of dirt. In all cases tetanus anti-toxic serum should be injected. It is not claimed that the inoculation protects the animal for any length of time, but the use of anti-toxic serum immunises the animal over the period in which infection might be gathered through an open wound.

THE CORRIEDALE IN QUEENSLAND.

It is not only in the Southern States that this valuable, dual-purpose sheep is attracting increasing attention.

Graziers in Queensland, especially on the fringe of the Downs, are advised to consider the establishment of a Corriedale flock. The main reasons for this advice arises from the fact that the pure-bred Corriedale lamb is a valuable animal, that the breed is far less susceptible to blowfly attack, and generally the returns from the Corriedale in comparatively small flocks compare more than favourably with merinos. The breed should be kept pure when this is possible. The main obstacle to action on this advice is obviously one of cost. Corriedale ewes are hard to come by and expensive when they are available. The constant use, however, of first-class rams mated with the largest, robust-woolled types of merinos will give quick results.

Systematic culling will greatly help in the establishment of a valuable flock of ewes. The wether section of the drop should be marketed as fat lambs if the season is favourable. Even in an unfavourable season, these male cross-breds make excellent wethers if a carry-over from the lamb stage is obligatory. The ewe lambs of the drop should be retained as future breeders.

SELECTING THE WELL SITE.

On many grazing properties in Queensland there is sufficient surface water to last until June or July in a normal year, and possibly until August in a good year, when there has been a heavy wet season. There is a period between the time that the surface water dries up and the first storms fall in which it is necessary to provide water, either by well or bore.

When selecting a site for a well or a bore, the grazier should first make a survey of his country. A site should, if possible, be selected on a part of the property where cattle do not feed intensively when surface water is available. On a number of grazing properties the mistake has been made of putting down a bore in close proximity to surface water. As the surface water dries up, the grass in the immediate vicinity is also eaten out, and when it is necessary to pump water

for stock there is often no grass in close proximity to the bore or well. As a result, the stock are forced to walk long distances to grass.

When bores and wells are put down in places away from surface water, there will probably be grass near at hand in a dry time, and cattle will do better, drink oftener, and retain condition that they would otherwise lose through excessive walking.

THE CORRIEDALE AND TYPE.

As in the Southern States, the Corriedale is fast growing in popularity in Queensland, and rightly so.

Some growers, however, lose sight of the reason for which this sheep was evolved—i.e., the strength of its covering. To grow merino counts on a Corriedale is to nullify, to a great extent, the most useful qualities of the breed. With the finer fleece invariably goes loss of size and constitution, and also diminished fleece weight.

The covering of a Corriedale should be a strong quality wool, full of character, of 54's to 56's counts in the case of rams, and only slightly finer in the case of ewes.

Strength without length in the breed is to be discouraged, as this makes for a common wool. Length must go with strength. Character and quality, too, must be insisted on if the lucrative prices given for good Corriedale wool are to be maintained.

As would be expected in a comparatively new breed, culling should be heavy to maintain quality.

In culling a Corriedale flock, it will be found that the vast majority of the culls come from two extremes, as it were. Those sheep showing Lincoln characteristics in too great a measure are not desirable, and, likewise, those leaning too much to the merino should be rejected. The happy medium between the two breeds with wool of the count indicated is the ideal. With this must go size and every indication of constitution.

BLOOD SMEARS FOR EXAMINATION.

When a grazier has lost several head of stock he is often obliged to take a blood smear from the remaining animals for examination in the laboratory at the Animal Health Station. This occurs particularly where such diseases as tick fever are suspected.

In taking a smear, use, if practicable, the small glass slides with which all stock inspectors are provided. If slides are not available, use any ordinary flat piece of glass such as a piece of broken window pane. In either case, the glass should first be thoroughly cleaned.

Puncture an ear vein after clipping and cleaning the ear. As the blood oozes out, *touch a small drop* and pick it up on the edge of one piece of glass. Then place the edge of the glass carrying the small drop of blood on the flat surface of a second piece of glass, holding the two pieces at an angle of approximately 45 degrees. By pushing the edge of the upper glass over the surface of the lower the blood spreads in a very thin film.

The edge of the glass carrying the small drop of blood should not be chipped or broken. It is essential that only a very small drop should be used, for too much blood gives a very thick film which is of little value in diagnostic work.

CATTLE DIPPING.

The dipping of cattle is sometimes treated casually in tick-infested areas, and this is not infrequently the cause of an unsatisfactory clean-up, and also of ill-effects on the stock such as scalding.

Cattle should be quietly driven to the dip and allowed to cool down in the yard before they are passed through the dipping fluid. "Rushing" is both unnecessary and undesirable. Cattle often tend to race back to the farm after treatment, but they should always be steadied down to a moderate pace.

Dairy cows are particularly susceptible to scald in the udder and injuries of this type frequently lead to difficulties in milking. Scalding is often attributed to too strong a dipping fluid; but the real trouble is more often the failure of the farmer to grease the sensitive parts of the udder before the cows leave the farm for the dip.

All the ticks may not be killed at one treatment, even when the dipping fluid is of standard strength. Ticks in the process of moulting may survive while travelling stock sometimes accumulate sufficient dirt and grime in the heavy winter coat to protect some of the more sheltered pests. Nevertheless, where reinfestation is not heavy, properly tended cattle should not be troubled by ticks for some time after dipping and the farmer cannot afford to neglect the only known method of coping with the pest.

STOCK DISEASE PREVENTION.

The object of disinfection is to destroy organisms and ultra-visible viruses which cause disease. It is a job which should certainly be done after the occurrence of one or more cases of contagious disease—such as tuberculosis, contagious abortion, swine fever, and influenza.

Periodical disinfection of stables, cow bails, piggeries, and poultry runs is highly commendable as a measure of disease prevention. The extent and thoroughness of the work would depend on the nature of the disease which had occurred, and would not need to be so extensive or intensive when merely carried out as a routine measure.

A common error in disinfecting premises is to first remove accumulations of excreta, discharges, dirt, and dust. As a consequence, the causal organisms and viruses contained in the accumulations are disseminated throughout the building, and may lodge in places which cannot be easily covered by the disinfecting solution afterwards. The proper way is first to apply liberally to all parts of the premises a suitable disinfectant in solution, and to leave it in contact for twenty-four hours. After the disinfectant has been allowed to act for that period, the walls and floors should be scraped (or scrubbed), and the scrapings soaked with kerosene and burnt.

Suitable solutions are phenol or other coal tar preparation (1 pint to 4 gallons water); chloride of lime (1 lb. to each gallon of water), or crude carbolic acid (1½ pints to 4 gallons water), to be sprayed on all surfaces.

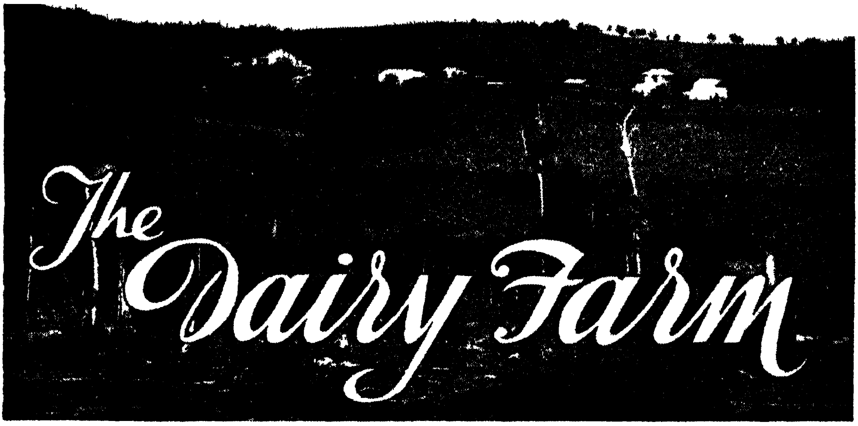
If shearing sheds and yards are disinfected before shearing commences, losses of stock through infection of wounds may be avoided.

PALATABILITY OF STOCK FOODS.

While the cost of the ration fed to dairy cows is likely to influence its composition, consideration should also be given to the palatability of the feeds selected. Nothing should be fed to the animals which will affect the quality of the product yielded. What is suitable for one animal may not be suitable for another, and the method of using stock foods governs their value. For producing animals —i.e., animals converting the food eaten into some product such as milk—it is essential that they should eat sufficient. In order to guarantee this sufficiency, care should be taken to ensure that the ration fed is wholesome and palatable.

Unless the ration is palatable, cows and fattening pigs will not consume sufficient feed to permit the efficient production of milk and cream, and bacon. Unpalatable feeds which have to be fed to milking cows should be used sparingly and mixed with some other well-liked feed. In this way, the bulk of the ration can be increased, the more palatable ingredients inducing the animal to consume the whole of the mixture. Roughage can be chopped and mixed with concentrates. The roughage often becomes softer and the mixture more wholesome and appetising by mixing it with a dilution of molasses.

It is only by feeding rations of a palatable nature that the maximum production can be obtained from live stock. At the same time, it must be remembered that an important function of farm animals is to convert into useful products material that would otherwise be wasted. By keeping a watch on the materials available, it should be possible to dispose of practically all the feed available in a way which will ensure the best return.



Feeding Whey to Calves.

E. B. RICE, Director of Dairying.

WITH the conversion of the product of many dairy farms from cream for butter-making to milk for cheese manufacture, the value of the by-product available for calf and pig raising will require some adjustment of the feeding methods hitherto operative on such farms. Strong healthy calves may be reared on whey provided it is fed in conjunction with suitable supplements and the usual precautions in successful calf-raising are observed. Acid whey is, however, quite unsuitable for calves, causing scouring and bloat, and has often been responsible for disappointing results. The development of acidity is retarded if the whey is subjected to heating by the cheese factory (as required by the Dairy Produce Acts) and its recontamination avoided. Whey held on the farm between feeding times must be kept in clean vessels in a cool, shady place.

Table I. sets out typical analyses of whole milk, separated milk, and whey.

TABLE I.

Composition of Whole Milk, Separated Milk, and Whey.

Constituent.	Whole milk.	Separated milk.	Whey.
	Per cent.	Per cent.	Per cent.
Water	87.00	90.55	93.91
Fat	4.00	0.11	0.35
Protein	3.25	3.39	0.10
Milk Sugar	5.00	5.20	4.60
Ash (mineral matter)	0.75	0.76	0.65

The variation in the food constituents of milk and its by-products is clearly reflected in this table. It will be seen that separated milk differs only markedly from whole milk in its deficiency of butter-fat. Whey, however, is deficient in protein, as well as butter-fat, both of which are won from the milk in the cheese-making process.

Suggestions for Feeding.

1. Remove the calf from its mother twenty-four hours after birth—when it will have had the benefit of its first drink of colostrum.

2. *First Week.*—Feed the mother's milk three times daily, commencing with 1 quart at each meal and gradually increasing until 1½-2 quarts are fed at each meal (the greater quantity for larger calves).

3. *Second Week.*—Feed whole milk (not necessarily the mother's milk) at the rate of 1 to 1½ gallons daily.

4. *Third Week.*—Gradually substitute whey for whole milk, the first day ½ lb. whey for milk at each feed, and progressively increase the amount of whey every few days until whole milk is entirely omitted from the ration by the end of the fourth week. Substitutes for the fat and protein lost from the original milk must also be provided in the third week. Fine grain meal (maize, oats, barley, grain sorghum, &c.) will suitably replace butter-fat, while linseed oil meal or meat meal will make good the protein deficiency. To teach the calf to take the cereal meal (maize meal preferably at the beginning), a few ounces are placed in the bottom of the feeding vessel after the milk has been drunk. The cereal meal is built up to 4 oz. in the first week, and thence a meal consisting of a mixture of grains is fed in increasing amounts every few days until the calf is receiving about 2 lb. daily. In a similar manner the protein meal is gradually introduced into the ration. If linseed oil meal is used, it must be mixed to a smooth paste with water, then more water added, and the mixture finally boiled for ten to twenty minutes before being fed to young calves. At first only a small quantity is given, and this is built up to 8 oz. to each gallon of whey fed.

Successful results in America have been obtained by feeding with whey a mixture consisting of 30 parts ground maize, 30 parts pollard, and 40 parts linseed meal or first-grade cotton-seed meal.

If meat meal is used, a suggested plan of feeding is—

Third week	1 oz. daily.
Fourth week	2 oz. daily.
Fifth week	3-4 oz. daily.
Sixth week	6-7 oz. daily.
Eighth week	8 oz. daily.

5. *Eighth Week.*—Water may now be substituted gradually for whey, and at the same time the protein-rich and cereal concentrates increased until 3-4 lb. are being fed daily, and the calf given free access to pasture or good legume hay. At this stage the supplementary feeding may be gradually discontinued and the animal allowed to fend for itself, but if good pasturage is not available, the feeding of increased quantities of concentrates or good legume hay is necessary.

GENERAL RULES.

Just as in rearing calves by any other method, certain rules require careful observance with whey-fed calves, the chief of which are—

(1) Maintain scrupulous cleanliness of feeding utensils, sheds, and yards.
(2) Avoid over-feeding.
(3) Feed all milk and whey at blood heat (98 deg. F.) for three months, thereafter at a slightly lower temperature, but not cold.
(4) Allow access to good pasturage or green succulent food after the third week.
(5) Supply ample clean, pure drinking water.
(6) Provide shade in summer and shelter in winter for young dairy stock.
(7) Provide a calf paddock.
(8) Give calves a mineral mixture consisting of equal parts of sterilised bone meal and salt.

Rigid standards for calf-feeding cannot be prescribed, as age, size, health, and vigour determine the requirements of each animal. Common sense and the special conditions applicable to each farm must be the guiding factors in rationing, but the suggestions contained in this paper are offered as a basis upon which a satisfactory system can be worked out.

Any further information on calf-raising will be supplied by the Department of Agriculture and Stock upon inquiry.

BITTER FLAVOUR IN CREAM—A SUSPECTED CAUSE.

A farmer, who for some time had been troubled with a bitter flavour in cream supplied to a butter factory, sought assistance with a view to finding out and remedying the defect. The taint invariably caused the cream to be de-graded from first to second, and, as an average of about eighty cows were milked on the farm all the year round, a great financial loss resulted from the de-grading of the cream. An inspection of the farm to ascertain the cause of the trouble

was made and the factory grader, who was familiar with the defect in the cream and who would be able to verify any suspected cause, accompanied the investigating dairy officer. A careful inspection revealed that the condition of the utensils and production methods followed on the farm were quite satisfactory and could not possibly be responsible for the bitterness in the cream. The feeds and method of feeding were also investigated, but no evidence could be found to suggest any likely cause of the taint.

However, during an inspection of the paddocks, where the cattle grazed, it was observed that a few trees, known locally as the Leichhardt tree, were growing. Pieces of the wood and leaves from this tree revealed an extremely bitter flavour, identical with that detected in the cream. Specimens of the wood and leaves from this tree were obtained. No evidence was seen of cattle having eaten leaves from this tree, but, nevertheless, some of the branches were within reach of the cattle. These trees have pods—which fall to the ground—and it is a theory that these pods are washed into little pools of water during the wet weather (the country is melon-holey) with the result that the soaking of the pods imparts the flavour to the water in these holes. As the cows on this property had been drinking this tainted water it is possible that the bitter flavour complained of was imparted to the milk and ultimately to the cream. This defect seems to occur during the hot, wet months of the year and this type of country would take many weeks to dry out again after heavy rain. Some of the wood from the Leichhardt tree was boiled in water and an extract obtained which had an acutely bitter flavour.

The Government Botanist, who examined specimens from the tree, reported that "the specimens represent *Sarcocephalus cordatus*, the Leichhardt tree or Canary Wood. The bark of this tree is known to contain a bitter principle. However, we have had no previous reports of this tree causing bitterness in dairy products. It is, of course, possible that litter from the trees falling into water which cows drink may give rise to bitterness in cream."

CLEANLINESS IN THE DAIRY.

The low standard of quality in some cream deliveries can be put down to carelessness on the farms or failure to use proper methods when washing dairy utensils.

Improper cleansing methods have always been a fruitful cause of second-grade cream. The cleansing of dairy utensils, if somewhat irksome, is not particularly difficult. From the point of view of cream quality, it is one of the most important jobs in the dairy; yet sometimes it does not receive the attention it warrants. This is due largely to the fact that the bacteriological aspect is not always properly understood. Because of climatic conditions in many parts of Queensland being suitable for bacterial growth, improperly washed dairy utensils result in a large amount of contamination of the cream supply, and consequently inferior cream. The object of cleaning dairy utensils and separator parts is not only to remove the milk or cream sticking to them, but also to kill all bacterial growth on them. The removal of the residue of milk or cream is not difficult, and is best done with proper brushes and warm water to which a small amount of washing soda has been added. It is important that all particles of milk or cream should be removed. Rags should not be used in the wash-up.

The next procedure is to kill the bacteria adhering to the utensils. The best method is by the use of heat in the form of boiling water or steam, and the boiling water treatment is the general method adopted. This is very effective when properly done.

To treat the utensils effectively, the water must be close to boiling point. Warm water is of very little value, and water which has been heated some distance from the dairy and left to stand at the wash-up bench for five or ten minutes after being taken off the fire cools off quickly to well below boiling point.

The most effective method is to place the separator parts and the smaller dairy utensils, after washing them properly, in the vessel used for heating water while it is still on the fire, making sure that the water comes to the boil. After five minutes, remove the utensils and hang them up or stand them in a clean atmosphere. They will dry thoroughly in a few minutes without the use of rags, and will be in perfect condition for the next milking.

It is safe to say that the percentage of inferior cream would be almost eliminated if these methods of treating dairy utensils were applied as part of the regular dairy routine and attention given to a few other details. By far the greater proportion of inferior cream is due to careless cleansing of utensils.

WHY CREAM TESTS VARY.

Some dairy farmers wonder why their factory returns show variations in the fat tests of their cream. Actually, variations are bound to occur.

Conditions under which milk is separated lead to changes in cream tests, as shown by the following facts:—

The separator should always be run at the speed directed by the manufacturer. It is better to turn at too high a rate than too low, for, in the latter case, the fat loss in the skim milk is increased in proportion to the decrease in the number of revolutions.

The milk must be allowed to enter the bowl freely during separation. The level is automatically controlled by the float, and if the flow is partly shut off a higher testing cream will result. An over supply will result in a lower testing cream, and, more important still, excessive fat loss will occur.

Milk is at the best temperature to be separated as it comes from the cow, as it is less viscous than at lower temperatures, so runs easily through the separator, and more perfect separation of the fat results. At lower temperatures, due to the viscosity of the milk, separation becomes more difficult with greater fat losses. It is doubtful whether any machine will do good work if the milk is below 80 degrees Fahrenheit.

The quantity of skim milk or water used to flush the bowl usually varies considerably from day to day, and may cause a variation in the test of 2 to 5 per cent., depending on the quality of cream. Vibration of the separator causes the skim milk and cream to be shaken together, so that they do not find their way to their respective outlets. Fat losses are increased by the escape of fat globules through the skim milk outlet.

Other factors which influence fat losses are the cleansing of the separator and the condition of the milk, but these should not cause any difficulty where there is a proper appreciation of the necessity of hygienic methods.

There is a daily variation in the fat content of the mixed milk from the herd, and this is sometimes appreciable. This affects the test of the cream, but does not influence the quantity. For example, if a herd produced 100 lb. of milk with a fat test of 4 per cent., there would be 4 lb. of butter fat, while, if the fat were 5 per cent., 5 lb. of butter fat would be the result.

QUALITY OF BUTTER AND CHEESE.

The dairyman should always bear in mind the fact that butter and cheese can be only as good as the milk from which they are manufactured. If milk of an inferior quality is produced, the butter or cheese factory cannot be expected to manufacture a first-class article.

Milk is the normal secretion obtained from the udder of a healthy cow, properly fed and cared for. Milk obtained during fifteen days immediately prior to, and ten days immediately following, calving, should be excluded from the bulk supplies. Milk should contain not less than 3.3 per cent. of milk fat, and must be free from any added water, separated milk, or preservatives.

Milk from cows suffering from mastitis, or any other disease of the udder, should not be used.

Cows should not be allowed to wade in or have access to stagnant water. The flanks should be brushed with a cloth when the animals come into the bails. Clean water and clean cloths should be used for the purpose of washing the udders and teats prior to milking, and the hands of the milkers should be washed before, and again after, milking each cow.

The first few drops of milk are usually contaminated and, therefore, should be milked into a tin and thrown away after milking. They should not be milked on to the ground, or thrown about the bails where they are liable to attract flies.

Musty feed must not be fed to cows. The animals should not be allowed to graze in paddocks known to contain weeds which will impart a detrimental flavour to milk, nor should they be fed highly flavoured foods immediately before or at the time of milking.

Dairy utensils should be thoroughly cleansed and scalded, then aired and dried in the sun in an inverted position.

Disinfectants, under normal conditions, should not be used in the dairy house or bails.

DAIRY CATTLE.

The difference in value of pure-bred and high-grade dairy cattle lies in the higher selling price of the pure-bred. Dairy farms which are so equipped that they can handle the record work effectively will find more profit in pure-bred than in grade cattle. There is a steady market for high-quality pure-bred cattle at prices which net good returns to the breeder. Whether pure-bred stock will show the best results with any particular dairy farmer depends, however, on his keeping authentic records, and also on his ability as a salesman. Pure-bred cattle which a breeder is unable to sell are no more valuable to him than an equal number of good grades.

A herd of carefully selected grade cows will produce as heavily as the average pure-bred herd, for the reason that they can be culled more closely, as their lower value does not encourage keeping an animal which is not a profitable producer. There is always a good demand for the female offspring at payable prices. Any person going in for dairying for the purpose of producing milk or cream, and not with the idea of gaining a large part of his income from the sale of stock, may do quite as well with grades as with pure-breds.

As in most things, success with dairy cattle depends on the individual farmer himself, and whether grade or pure-bred cattle are more desirable can be settled only when the particular conditions surrounding the individual case are considered.

It is sometimes stated that grade cows are better than pure-bred animals. This is not so, but it is true that some grades are better than some pure-bred stock.

One very important fact to remember, however, is that the herd sire should always be a pure-bred. Unfortunately, this is not sufficiently understood by some Queensland dairy farmers, and this accounts to a very large extent for the poor type of dairy cattle one sometimes sees when travelling through the country.

SORE TEATS IN MILKING COWS.

Sore teats cause much loss to the dairy farmer, and the condition should always be suitably treated on its first appearance. Chapped teats are caused by the sudden chilling of the teats after wet milking, after the calf has ceased sucking, or by contact with stagnant water, filth, or irritants when lying down.

The chapping may be slight, or, on the other hand, it may extend into gaping sores, inducing retention of milk or even causing mammitis.

Sore teats may be prevented by washing the udder and teats thoroughly with warm water and soap when the cow first comes in, carefully drying the udder before applying olive oil to the teats. If the cow already has sore teats, they should be washed with warm soapy water; then thoroughly dried and treated with carbolised vaseline. If the sores are extensive and the irritation great, the teats should first be washed with a solution of 1 dram of sugar of lead to 1 pint of rain water, after which benzoated zinc oxide ointment should be applied.

The careful use of a sterile teat syphon is desirable when the sores are very deep and painful, as manual milking opens the sores continually. Wet milking is a dirty and undesirable practice from every point of view.

CARE OF MILKING MACHINE AIRLINES.

In the course of farm visits dairy officers find that the airline on milking machines is often neglected, because some farmers do not realise its contaminatory influence. The defective quality of much machine-produced milk and cream is often largely attributable to this cause.

On modern milking plants the airline, like other mechanical parts, is simple to clean, but in some of the old-type machines it is very difficult to keep free from contamination. Milk of satisfactory quality can only be expected if the utmost care is given to cleaning the airline, as well as other parts of the plant.

Some careful producers flush out the airline daily, but investigations among suppliers to cheese factories have shown that milk of good quality can be produced with milking machines the airline of which is well flushed out and effectively steamed once weekly—twice weekly in the hotter months would probably be advisable.

Feeding Whey to Pigs.

T. ABELL, Pig Section.

WHEY is a good food for pigs, and if used in proper balance with other foods gives results similar to those obtained by feeding separated milk. Whey is lower in protein content than, and its total food value is approximately half that of, skim milk. (For composition of whole milk, skim milk, and whey, see Table I., page 143 of this issue.) This does not necessarily mean that twice the volume of whey must be fed to obtain similar results in pig feeding. As with skim milk, whey may be fed with success to all classes of pigs—from weaners to sows suckling litters—provided that the following recommendations are followed.

Whey must be fed while fresh, and should be kept as clean as possible. The whey should be collected frequently, and the containers used should be cleaned before each lot of whey is placed in them. Never put fresh whey into drums containing stale whey. The drums should not be left in the sun, and the tops should be covered with old bags or board lids to keep out flies. Dirty and stale whey is responsible for most of the digestive disorders occurring in whey-fed pigs, particularly weaners and stores.

Pigs should be given small amounts of fresh whey at about six weeks of age to accustom them to the ration they will receive when weaned. At this stage they should also receive a small amount of grain to chew. Start with about a pint daily per pig, and gradually increase the whey so that at eight weeks of age each pig receives about 1 gallon daily. The grain should have been increased to about 1½ lb. daily by this time. A week before weaning commence feeding a protein-rich food such as meat meal (60 per cent. protein) or first-grade cotton-seed meal. About one dessertspoonful is sufficient to start with, and this should be gradually increased so that when weaned each pig receives ¼ lb. daily. This amount of meat meal need not be increased as the pigs grow; the whey and grain are increased gradually till each pig is receiving 1 lb. of grain per 25 lb. live weight, and just as much whey as it will drink comfortably. The feeding of large quantities of whey to young pigs is responsible for the unthrifty pot-bellied appearance sometimes seen in whey-fed pigs.

Where possible, all whey-fed pigs should have access to pasture. If grazing is not available, they should have green food cut and fed by hand, or receive a small amount of lucerne hay or chaff daily; this is to make good any vitamin deficiency.

Minerals are also important in whey feeding; therefore, if the pigs are receiving cotton-seed meal instead of meat meal, and pasture or legume hay is scarce, a mineral mixture should be fed in small amounts. Two parts of sterilized bone meal to one of salt make an excellent mixture.

For pigs receiving wheat, barley, or grain sorghum as the grain portion of the ration the meat meal or cotton-seed meal may be eliminated by the time they

reach 120 lb. live weight, provided they are receiving pasture or lucerne hay. Pigs receiving maize, however, should continue to receive a little of the protein-rich concentrate.

Dry sows will do well on pasture or lucerne hay, as much whey as they can handle comfortably, and from 3 to 4 lb. of grain daily. Sows nursing litters will require much more food. They should be fed very sparingly for the first two days—on about 1 gallon of whey and 2 to 3 lb. of grain. Gradually increase the whey and grain until at the end of about ten days the sow is receiving as much whey as she can drink comfortably and 8 to 10 lb. of grain. The addition of ¼ lb. of meat meal is recommended if pasture or lucerne hay is scarce. Boars may be fed similarly to dry sows.

If cotton-seed meal is used instead of meat meal, it should be fed at the rate of 3 parts for every 2 parts of meat meal it replaces—e.g., to replace 4 oz. of meat meal, feed 6 oz. of cotton seed meal.

Briefly, fresh clean whey, fed in conjunction with grain and other farm crops, together with pasture and a protein-rich concentrate, will give excellent results in pig-feeding. Any further information required on pig-feeding will be supplied upon application to the Department of Agriculture and Stock.

POINTS OF A GOOD BOAR.

When selecting a boar the best available should be bought, for during his life he may be the sire of hundreds of pigs, while the sow can only produce a limited number. If the boar is good he will improve the standard of the herd. His selection, therefore, is of very great importance.

The boar should come from a large, thrifty litter, and be obtained from a reliable breeder. He should be of correct type for mating with the sows, not too chunky or short, but showing full development at every point, strictly masculine, and fully typical of his breed. He must show quality, smoothness, and evenness in every part, have a typical masculine head, with eyes and ears wide apart, the jowl reasonably full and well laid on to the shoulders, which should be smooth and free from wrinkles. He should have a full heart-girth extending well down to the bottom lines, nearly or quite on a level, with as deep a flank as possible. He should possess rather short or medium length legs, with bone of fair size and quality, pasterns short and straight, and the hoofs well set, legs standing square, straight and well under him. A long, wide and deep ham, and tail well set up are also desirable characteristics.

ROOTS FOR PIGS.

Successful pig raising depends largely on the production on the farm of suitable root crops. The crops should be fed to the pigs on the paddock system which permits the animals to do some of their own harvesting, and also suits their natural inclination to graze and search for roots.

Under normal seasonal conditions, there are many root crops which possess a high food value and are more or less resistant to the immediate effects of dry weather.

Root crops recommended for pig feeding include sweet potatoes and English potatoes (after picking out the marketable potatoes, there always remain the small and broken tubers), Swede turnips, mangel wurzels, and several varieties of sugar beet. Arrowroot is worth consideration as a carry-over crop, while, in Central and North Queensland, varieties of cassava are worth cultivating in heavy types of soil which are less suitable for sweet potatoes. Of all these root crops, however, sweet potatoes are regarded by many pig farmers as the most useful.

In experiments conducted by the Department of Agriculture and Stock, Belgian field carrots gave results indicating that they are worth a trial. Onions are unsuitable for pig feeding. Jerusalem artichokes are not grown in Queensland to the extent that their importance as a pig food warrants. They are adapted to cultivation in a wide range of soils, although, like sweet potatoes, they do best in a deep loamy or sandy soil rich in humus and with plenty of moisture.

PIG BRANDING.

Under the Queensland Pig Industry Act, the identification of all pigs sold, offered for sale, barter, or exchange, is compulsory. This is essential to satisfactory marketing of this class of stock, and where marking is carried out as a regular routine job, presents little difficulty. Identification facilitates investigation into disease, whether epidemic or otherwise.

The Act provides particularly for the marking of all pigs consigned to factories, and there has been widespread appreciation of its value. There may be differences of opinion in regard to the advantages of various systems of identification; but from a factory point of view it is a very great advantage to have the carcases plainly identified.

Exporters prefer the body tattoo as a means of identification, and bacon-curers almost without exception are more than satisfied if the carcases are tattooed efficiently. The use of the firebrand is being superseded generally by the more efficient method of tattooing, in which a body-tattooing instrument and marking paste or ink are used.

The marking of sucker, weaner, and store pigs presents greater difficulty, because neither the body tattoo nor the firebrand are sufficiently permanent where the pigs are to be retained on the farm for periods varying from two to five months. In the case of these young pigs, two systems are especially adaptable, viz., earmarking and ear-tattooing, the latter being suitable only in the case of white or red coloured pigs.

The departmental pamphlet, "Identification of Pigs," is available free on application to the Department of Agriculture and Stock, Brisbane.

THE PADDOCK SYSTEM OF PIG RAISING.

Farmers who have not already adopted the practice are advised to give careful consideration to the advantages of running pigs on the grazing system as compared with the intensive penning system which, until a few years ago, was the recognised practice of most pig keepers.

There is little doubt that the old custom of confining pigs to small pens resulted from the desire to produce very fat carcases. Present-day buyers demand leaner pork and bacon, so it is necessary to alter pig-raising practice accordingly, especially in respect of breeding, feeding, and penning. Provided pigs are bred to the correct type—that is, pigs intended for light porkers bred from quick-maturing stock, and pigs intended for baconers bred from later-maturing stock—they may be kept under grazing conditions from birth until fit for slaughter with very good results. Pigs kept in paddocks throughout their lives have a tendency to grow rather than fatten, and it is the lean, growing pig and not the fat pig which is required for meat.

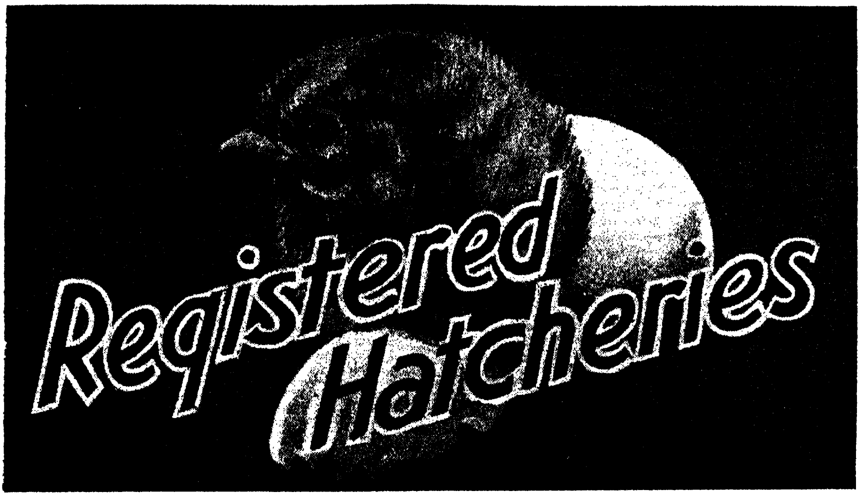
When grazed, pigs find a lot of their food in the form of pasture or forage crops specially grown in the pig paddocks, and these foods usually require less labour and are cheaper than other pig foods. The pigs not only do their own harvesting but also return a good amount of manurial matter to the soil, thus maintaining or improving soil fertility.

With the run of a good paddock containing some pasture or green crop, there is very little chance of pigs suffering from mineral or vitamin deficiency. This is a decided advantage over the intensive penning system, in which ill-health often results from a lack of knowledge or care in attempting to supply a complete diet. Penned pigs often suffer from dietetic disorders, and when turned out on pasture recover rapidly.

Under the intensive system, it is necessary to have buildings, floors, and drains well constructed in order to maintain a safe standard of hygiene. This also means extra labour and water for cleansing pens.

There is little, if any, difference in the costs of establishing a good paddock piggery and a good intensive piggery. One of the most important features of a paddock piggery is that the work of tending the pigs is much more congenial, for the only cleaning-up of the piggery consists of cultivating or resting the pig paddock and moving the sheds and troughs, which should be built on skids to allow of easy transport.

Probably the most practical method of controlling worm infestation in pigs is to run them in paddocks which can be cropped, fed off, and ploughed in rotation. This system and the use of movable equipment is a very satisfactory method of pig raising under Queensland conditions.



Name and Address.	Name of Hatchery.	Breeds Kept.
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	Australorps
W. Brown, Waterworks road, The Gap, Ashgrove	Strathleven ..	White Leghorns
W. T. Burden, 44 Drayton road, Toowoomba	Harristown ..	White Leghorns, Australorps, and Rhode Island Reds
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca.. ..	White Leghorns and Australorps
W. C. Carlow, Upper Brookfield	Adaville ..	Australorps, White and Brown Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlinton ..	White Leghorns
W. Chataway, Cleveland ..	Wilona ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
Mrs. M. M. Cousner, The Gap, Ashgrove	Progressive Poultry Farm	Australorps and White Leghorns
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, and Rhode Island Reds
O. M. Dart, Brookfield	Woodville ..	White Leghorns, Australorps, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros. ..	White Leghorns
T. Duval, Home Hill	Athalie ..	White Leghorns and Rhode Island Reds
E. Eckert, Head street, Laidley	Laidley ..	Australorps, Langshans, and White Leghorns
Elks and Sudlow, Beerwah ..	Woodlands ..	White Leghorns and Australorps
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner ..	Australorps
F. Farrier, Miller road, Birkdale	Glenwood ..	White Leghorns
B. E. W. Frederich, Oxley road, Corinda	Glenalbyn ..	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
C. and C. E. Gustafson, Tannymorel	Bellevue ..	White Leghorns, Australorps, and Rhode Island Reds

Name and Address.	Name of Hatchery	Breeds Kept.
F. E. Hills, Sims road, Bundaberg	Littlemore ..	Rhode Island Reds, Australorps, White Wyandottes, White Leghorns, and Langshans
C. Hodges, Kuraby	Kuraby ..	White Leghorns
A. E. Hoopert, 24 Greenwattle street, Toowoomba	Kensington ..	Australorps, Rhode Island Reds, and White Leghorns
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
Miss K. E. Jenkins, Phillip street, Sandgate	Brooklands ..	Australorps, White and Brown Leghorns
S. W. Kay, Cemetery road, Mackay	Kay's Poultry Stud	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
W. A. Lehfeldt, Kalapa ..	Lehfeldt's ..	Australorps
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps, White Leghorns, and Light Sussex
J. McCulloch, Whites road, Manly	Hinde's Stud Poultry Farm	White and Brown Leghorns and Australorps
W. S. McDonald, Babinda ..	Redbird ..	Rhode Island Reds and Anconas
F. W. McNamara, Vogel road, Brassall, Ipswich	Franmara ..	White Leghorns and Australorps
A. Malvine, junr., Waterworks road, The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White and Black Leghorns
A. E. Mengel, Campbell street, Toowoomba	Glenmore ..	White, Black, and Brown Leg-Leghorns, Anconas, Australorps, and Rhode Island Reds
C. Mengel, New Lindum road, Wynnum West	Mengel's ..	Australorps
J. A. Miller, Charters Towers ..	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	White and Brown Leghorns and Australorps
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor	Ferndale ..	White and Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Coopers Plains	Norups	White Leghorns and Australorps
C. O'Brien, Hugh street, Townsville	Paramount ..	White Leghorns and Rhode Island Reds
H. Obst and Sons, Shepperd ..	Collegeholme ..	White Leghorns and Rhode Island Reds
A. C. Pearce, Marlborough ..	Marlborough ..	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, and Langshans
E. K. Pennefather, Douglas street, Oxley Central	Pennefather's ..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farms	White Wyandottes, White Leghorns, Brown Leghorns, Australorps, Rhode Island Reds, Langshans, and Light Sussex
G. R. Rawson, Upper Mount Gravatt	Rawson's ..	Australorps
J. Richards, P.O., Atherton ..	Mountain View	Leghorns and Australorps
W. G. Robertson, Bilsen road, Nundah	Ellerslie ..	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa Stud Poultry Farm	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
W. B. Slawson, Camp Mountain	Kupidabin ..	White Leghorns, Australorps, and Light Sussex
Mrs. A. Smith, Beerwah	Endcliffe ..	Australorps and White Leghorns
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Australorps
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. G. Teitzel, West street, Aitkenvale, Townsville	Teitzel's ..	White Leghorns and Australorps
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns and Australorps,
P. and K. Walsh, Pinklands, via Cleveland	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's ..	Australorps, White and Brown Leghorns, Anconas, Minorcas, Rhode Island Reds, Indian Game, and Bantams
H. M. Witty, Boundary road, Kuraby	Witty's ..	White Leghorns
P. A. Wright, Laidley	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps

HOUSING COCKERELS.

In the rearing of any large number of cockerels, either for breeding or table purposes, one of the outstanding problems is that of providing satisfactory housing. It happens frequently that cockerels are injured by fighting among themselves. Generally speaking, fighting is more prevalent among light breeds, such as white leghorns, than among australorps and other heavy breeds.

The rearing of a large number of cockerels of a similar age could be arranged to great advantage by the provision of a special house. The type of house recommended is one in which the roof reaches approximately 2 feet from the ground. For efficiency, economy, and simplicity of construction, a building of the gable-end type should meet requirements. The size, naturally, will depend on the number of birds to be accommodated. A building 12 feet long by 8 feet wide will accommodate, as a maximum, 100 white leghorns or 80 australorps. Approximately one square foot of floor space is allowed for each bird. Hens, however, should be provided with double that area under the same system, and the small space proposed for the cockerels is only practicable because of the fact that they will occupy the house only for a short period.

In the construction of such a building, the four corner posts may be 3 feet, and the two centre posts 7 feet high. By using 8-feet iron the roof will extend to within 2 feet of the ground. The gable-end should face to a point between north and east. This will permit of the front being left uncovered, while the rear or westerly end should be covered with iron to within 2 feet of the ground. Perches are the only fittings necessary. These should be all on the same level, and 3 feet above the floor. They should run lengthwise, and should be spaced 2 feet apart. Such spacing would obviate fighting on the perches.

It is essential for a building of this type to be erected in the centre of a large netted run, or at a distance from other buildings if the birds are to be reared on free range. In addition, it is advisable to erect a number of perches in different parts of the run. Such perches should be 3 feet high and situated away from boundary fences.

The advantages of this system of handling cockerels are that there are no corners or walls in the building, and on being chased the bird can escape easily by getting on a perch. An old cock bird placed in the pen, before the cockerels are three months of age, will assist materially in preventing the young birds from fighting.

Agricultural Notes

How to Make and Fill a Trench Silo.

A FEW important points in the construction, method of filling, and emptying of a trench silo are briefly given for the benefit of interested farmers.

Select a reasonably level and well-drained site as near the place of feeding as conveniently possible. Mark it out according to the capacity required. A trench 30 feet in length, 8 feet wide at bottom, 12 feet at top, and 8 feet deep, having an outslope at each end of 1 in 3 grade, would hold approximately 45 tons. By altering the length and retaining the other measurements, the capacity may be increased a ton for each additional foot length.

To construct the trench, excavate according to the desired dimensions, using plough and scoop and depositing the spoil along either side to back up the logs, which should be placed lengthwise to raise the walls 2 feet above the surface. Complete the job by trimming the walls smooth with mattock and spade.

The cost of construction involves labour only, and the time taken would vary according to the nature of the ground. In ordinary circumstances, two men equipped with suitable plant should excavate a trench of 45-ton capacity in about two or three days.

In filling the trench silo there is no necessity to chaff the material, full-length crops being loaded in the field and drawn through the trench, off tipped, and spread in even layers lengthwise, the empty vehicle passing out the other end. Thus each layer is consolidated as a result of the trampling of the horses' action throughout the whole filling process.

Should the crop be at all dry through over-maturity or as a result of frost, a sprinkling of water may be added during the filling process. The filling should continue well above the surface, forming a parapet of about 3 feet high, sloped towards the sides of the trench.

Complete the filling by covering it with grass well watered, finally topping with a 9-inch to a 12-inch layer of earth.

The material so stored will be fit to use as silage in from two to three months after filling, if so desired, or it may be safely stored for many years without undue deterioration or loss.

To remove the silage for use, the trench should be opened up at one end, taking the earth and grass covering from a portion only as required, and cutting down vertically with a sharp implement, such as a spade or hay knife. When a complete face section from top to bottom has been removed, an adze may be used to slice off additional material in a semi-chaffed or short-chopped form, resulting in its being in a more acceptable condition for feeding direct to stock without further preparation.

The silage may be fed as it is to practically all classes of stock. For cows in full milk, however, better results are obtained by the addition of a small quantity of protein-rich fodder and concentrate—such as lucerne chaff and cotton-seed meal.

Further particulars about silos and silage may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

WINDBREAKS AND SHELTER TREES ON THE DARLING DOWNS.

For the comfort of stock in cold weather, windbreaks are a necessity, especially on open plain or high tableland country. In timbered country, provision should be made for windbreaks when the land is being cleared by leaving suitable stands of the original forest covering; otherwise, the expense of establishing shelter belts will have to be incurred later on. Meanwhile, stock will have to suffer all the discomfort caused by winter's frigid westerlies, which blow usually for days on end.

In country which has already been cleared the planting of suitable trees on the prevailing windward boundaries of farms on tablelands, plains, and undulating country is, therefore, worth serious consideration. If edible trees are planted they might be used in times of drought. A farmer would naturally hesitate before destroying shelter trees for feeding purposes, but, if the necessity arises, edible trees may be lopped without destroying them.

The undermentioned trees are mainly suitable for planting on the Darling Downs. Edible types are the kurrajong, bottle tree, Portuguese elm, honey locust, and carob bean. Less palatable trees are the cypress (*Cupressus torulosa*), *Pinus radiata*—commonly known as *Pinus insignis*—white cedar, and *Bauhinia hookeri.* The well-known and admirable western tree, the wilga, should be added to this list if it is available in the local forests. Although there is a considerable amount of variation in the palatability of individual trees, the wilga is both a useful and extremely ornamental species.

In most cases the trees mentioned can be purchased from nurserymen. In the event of expense proving an obstacle to adequate planting, the trees can be raised from seed in an improvised nursery on the farm. The seeds could be germinated in shallow boxes or tins about twelve months before the young trees are required for planting. In frost-free areas June, July, and August are suitable months for planting out the young trees in their permanent locations. Some protection must, however, be given to the plants in frost-susceptible districts if midwinter planting is attempted.

Protecting the young trees from stock is most important. If the trees are planted near a boundary fence, it might be found most convenient to erect a second inner fence to keep stock away from the trees until they are high enough to be out of reach. Smaller farm stock, such as sheep, can be let into the enclosure once the trees have attained sufficient height for their foliage to be above the reach of the animals.

WINTER-GROWING RHODES GRASS—A RISK.

Although warnings that the so-called winter-growing or frost-resistant Rhodes grass is a potential source of danger to grazing stock have previously been issued, some farmers may not yet be aware that this grass should be grazed with caution. Winter-growing Rhodes grass should not be confused with the more common Rhodes grass which makes a very valuable pasture.

The prussic acid content of winter-growing Rhodes grass has been determined in samples collected both in Queensland and in New South Wales, and the quantity found was sufficient to indicate that the grass may sometimes be toxic to animals. Little is known about the conditions under which stock losses due to ingestion of the grass may occur, and stockowners are advised to be very careful when paddocks of the grass are being grazed.

In districts where high-yielding winter-growing grasses and clovers can be grown, the use of the winter-growing Rhodes grass for grazing purposes is not recommended.

SALT FOR THE HORSE.

A good farm horse is well worth his feed. Most farmers realise this, but all too frequently plough horses may be seen licking the dried sweat from each other. Working horses are incapable of sustained effort without a liberal supply of salt, and when the food is low in this mineral they try to remedy the deficiency by licking the saline deposit from evaporated sweat round the collar, saddle, and other gear of a team mate.

It is, therefore, sound practice to keep rock salt in a convenient place for working horses.

CERTIFIED POTATO SEED.

Although good seed is a prime consideration in the successful cultivation of potatoes, a large quantity of inferior seed is marketed annually in Queensland, and the following information is intended, therefore, as a guide to farmers in the purchase of good-quality seed potatoes at a reasonable cost.

In the past, the quantity of high-quality certified seed has been limited, and this factor has had a bearing on the low average returns per acre obtained, particularly from the early or spring crop, when growers have to rely on seed purchased from southern States.

Growers specialising in the selection of certified seed endeavour to obtain tubers from healthy, vigorous plants of good type and varietal purity and reasonably free from mechanical and insect injury.

The selection of plants free from virus diseases also is important, for, although such diseases will cause a marked degeneration, their presence may not be revealed by the appearance of the tubers.

The growth and sale of seed potatoes in New South Wales is now undertaken by the Certified Seed Potatoes (N.S.W.) Co-op. Ltd., 52 Bridge street, Sydney, of which the secretary (Mr. J. L. Shute) has supplied the following list of registered certified seed growers' associations, from which seed can be obtained for present seasonal plantings:—

Location.	Variety.	Secretary.
Bannister	Factor, Katahdin	J. Gorman, Bannister
Batlow	Factor, Katahdin	Batlow Packing House Co-op. Society, Batlow
Cotta Walla	Factor	J. Kennedy, Cotta Walla
Guy Fawkes	Factor	J. W. Hartman, Guy Fawkes
Guyra	Factor, Early Manhattan, Late Satisfaction	H. S. King, Glenroy, Guyra
Millthorpe	Factor	Roy Moad, Fairview, Millthorpe
Oberon	Factor, Katahdin	F. J. Gibbes, Oberon street, Oberon
Orange	Factor	Orange Producers' Co-op. Society, Grange
Redground	Factor	R. M. Broderick, Pinedale, Laggan
Taralga	Factor, Katahdin	J. J. Moloney, Taralga

The New South Wales Department of Agriculture controls the inspection and certification of potatoes, and has delegated the packing and distribution of such seed to the association mentioned.

For the present season, the price of certified seed has been fixed at £9 per ton, f.o.r. at growers' railway stations.

Certified seed potatoes from the southern States may also be procured through the agency of seedsmen and produce merchants in Brisbane and elsewhere in Queensland.

Any extra cost incurred in the purchase of certified seed is more than offset by the value of the resultant crops.

PARA GRASS FOR SWAMP LANDS.

Throughout a considerable stretch of the northern coastal country swampy areas of lesser or greater extent are encountered, particularly in the wetter regions where dairying is now being developed. These lands, to a large extent lying idle, could, at no great cost, be utilised by planting them with para grass. This grass is easy to establish, because of its habit of rooting freely at the nodes. It is a rather coarse, vigorous grower, but has succulent stems and leaves and gives a large quantity of green material per acre. Under favourable conditions, yields over 30 tons per acre have been obtained in one year. It is easily cut back by frost, and is, therefore, most suitable for the warmer localities.

This grass grows well in swampy localities, the runners going out even into deep water. Once established, it holds its own with any other grass. It has a further advantage in that it is credited with completely drying out marsh lands.

Para grass is usually propagated by runners, which root readily. These runners can be easily planted in furrows about 3 feet apart and about the same distance between the rows.

Cabbage-growing for Market.

THE cabbage is one of the most important vegetables for the market gardener. It grows best in the cooler districts, but by carefully selecting varieties the crop may be grown in most parts of Queensland.

The seed should be sown in beds of well-drained, deeply and thoroughly worked soil. The soil, if heavy, should be improved by the addition of sand or decayed vegetable matter; if poor and sandy, the addition of a loamy soil or well-rotted manure will be beneficial.

The surface of the bed should be fertilized and firmed, and the seed sown thinly in shallow drills about 4 inches apart. After sowing, mulch the bed with well-rotted leaf mould to prevent excessive evaporation of moisture.

The seed-bed must be watered regularly, for a check in the growth of young seedlings is often followed by unsatisfactory results.

When large enough to handle, the seedlings should be thinned to an inch apart, for if grown too thickly they develop into long, spindly, weak plants.

Shading during the hottest part of the day is often necessary, but this shade should be removed as soon as the plants are strong enough to withstand the heat. Overshading also produces spindly plants. Approximately 1 lb. of seed will provide sufficient plants for an acre of cabbage.

In about six weeks the young plants should be large enough for transplanting. They may then be hardened off by restricting water supplies for a day or two before their removal to the field. Transplanting should be done in cloudy or showery weather, but if weather conditions are unfavourable the young seedlings should be watered in, and, as a further precaution, the top half of the leaves may be trimmed off to lessen transpiration until the root system is established.

Loosening of the soil in the seed-bed with a fork before lifting the plants helps to save many of the small roots. If the bed has been well soaked previously, the plants will lift with a ball of soil adhering to the roots, which will help to keep them moist.

The roots of the young plants should be kept damp after removal from the bed, and this may be done by standing them in a bucket containing a puddle of soil and water.

In planting, a hole is first made in the ground with a dibble—an old spade or digging fork handle is suitable. The hole should be only deep enough to allow the roots of the seedling to reach the bottom of the hole. Turn in a little earth, and then draw the plant slightly upwards before pressing the soil firmly around it. This ensures that the main root will not be doubled up.

The plants should be in rows 3 feet apart; in the rows the smaller varieties should be spaced 2½ feet and the larger varieties 3 feet apart. The growth of cabbages should on no account be checked. Regular cultivation and watering are, therefore, essential.

The right varieties should be selected for different times of the year. Winter planting types should be early and quick maturing.

In the cooler areas, seed of the early varieties is sown during autumn. Main crop varieties are sown between August and December. The coastal districts are best suited to the winter crop.

Cabbage should be marketed as soon as possible after cutting, and only good, firm-hearted vegetables should be sent for sale. Care in handling is essential, and when placed in bags for railing they should be packed as firmly as possible.

Recommended varieties are:—

Early.—Early Allhead and Early Drumhead, both of which are large, early, and quick growers.

Main Crop.—Succession is the most popular variety, and may be grown almost any time. It is a good large Drumhead type.

Surehead is slightly larger than succession. It is hardy, and may be planted closer in the rows, as it has fewer outside leaves.

CONTROL OF CABBAGE PESTS.

In common with other crop plants, the cabbage is subject to the attacks of a number of insect pests which, if not adequately controlled, are capable of completely destroying the plants or at least rendering them unfit for market. Every grower should know these insect pests, and should be prepared to carry out the necessary control measures. It is now generally recognised that, as a health safeguard, a poison such as arsenate of lead, formerly in common use, must not be applied to edible foliage. As there is available on the market a range of insecticides containing derris which is toxic to most leaf-eating insects of the cabbage but non-poisonous to man, the use of arsenate of lead on this type of plant is unnecessary. Derris is sold under various trade names ready for application as a dust, or in a form suitable for mixing into a spray, and is marketed by most dealers in insecticides.

During the period of seed-bed growth the young plants should be given frequent applications of derris in either spray or dust form. Such treatment will reduce any incipient infestations of cabbage grubs or cabbage aphis.

In the field the young transplants may be destroyed during their early stages of growth by either cutworms or false wireworms. Both of these insects feed at night, the young plants being usually cut down at ground level. Cutworms are particularly injurious in the spring months, but damage by false wireworms has been experienced at other times in the year. Whenever this cutting of seedlings is noticed, an immediate application of the well-known cutworm bran bait should be made; late afternoon is the best time for the application.

The commonest insect pest of the half to full grown plant is the cabbage moth, whose caterpillars eat numerous holes into the foliage. The caterpillars are small, green in colour, and owing to their activity when disturbed, they are often referred to as green wrigglers. This insect breeds more rapidly in the summer, but it may be found on the plants throughout the year.

Thorough application of derris sprays or dusts once a week on the plants throughout their period of field growth will give adequate protection against this insect and also prevent any noticeable infestations of cabbage aphis. This aphis usually occurs in clusters of small, slow-moving insects covered by a whitish mealy secretion, the clusters being associated with curled and malformed foliage. These insects feed by sucking the sap, and both because of the malformation and the lowered vitality of the plant that accompany infestation, their control is necessary.

In the summer months a caterpillar generally referred to as the centre grub is frequently serious. This insect may burrow down the centre of young transplants into the stalk, and thus kill out the growing point. As the root system of

the plant is usually established by this time, a number of suckers will be produced. By cutting away all but the best of these, a satisfactory plant may later be produced. Derris applications are less effective against this insect than against larvæ of the cabbage moth.

Unfortunately, the corn-ear worm occasionally causes serious injury to cabbages. The only line of attack that can be suggested is to grow cabbages as far as possible from alternative host crops, such as tomatoes, maize, and cotton, and to eliminate weed growth in and near the cabbage area.

As general measures, crop residues should, as far as possible, be gathered and destroyed at the end of a crop and, if practicable, successive plantings should not be made on closely adjacent areas. These precautions will reduce the carry-over of the various insects.

CONTROL OF WHITE LOUSE OF CITRUS.

White louse of citrus occurs throughout the State, and although temperature does not appear to be an important factor determining its abundance, there seems to be reason for believing that it prefers dry climatic conditions. All portions of the tree are subject to attack, but infestation generally starts on the trunk near ground level and spreads upwards. The male scales are a very conspicuous white colour, and as they are much more numerous than the female scales, a colony of this species produces a white appearance on the infested surface which has led to its being given the quite appropriate name of white louse.

It is not a difficult insect to control, but growers should remember that vigorously growing trees are much less susceptible to attack than trees in poor health. The health of infested trees should, therefore, be attended to in order to reduce susceptibility, and whatever adverse factor is impairing their health should be eliminated so far as practicable.

Spraying with lime-sulphur gives a very good control of white louse. Control is generally best accomplished by spraying in the late winter just before blossoming, using lime-sulphur at a strength of one to fifteen. The preference for lime-sulphur is based very largely on the fact that its application is attended by other beneficial results in addition to establishing control of white louse.

When the correct time for spraying has arrived certain late-maturing varieties, e.g., the Valencia late, may still be carrying fruit. This does not really matter very much because usually only the inside parts of the tree require spraying. However, should the harvesting of the crop have been completed, then it is desirable that the whole tree be sprayed.

Fumigation with hydrocyanic acid gas also gives a good control of the white louse, and can be employed against it when conditions render fumigation practicable.

PREPARING LAND FOR SPRING PLANTING OF PINEAPPLES.

The early preparation of land for the spring planting of pineapples is desirable, and areas to be planted should be ploughed now, as deeply as the implements available and the depth of the surface soil will permit. If possible, this ploughing should be followed by at least one subsoiling to a depth of 18 inches. On no account should the subsoil be brought to the surface. The land should be left in the rough for some time; and, later, ploughed and cultivated to an even tilth. It will then be in good condition for planting at a favourable opportunity in the spring. It should be borne in mind that a stand of pineapples remains in the ground for several years, and, consequently, deep cultivation should be done before planting.

Adequate preparation, as suggested, improves both the aeration and moisture-holding capacity of the soil and thus enables root growth to develop under the most favourable conditions. This is most important, since the first few months of the life of a pineapple plantation largely determine its productivity. Furthermore, as has been amply demonstrated, vigorously growing plants are highly resistant to disease.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

THIS season has provided probably the finest display of cauliflowers ever seen. Tomato growers also are producing some excellent fruit, although heavy losses have been experienced. Prices for coloured tomatoes are at high levels on all markets. Growers should take care to have only coloured fruit in their consignments. With the cooler weather experienced at this time of the year the risk of loss is small.

Pineapples and papaws should be showing plenty of colour before picking. As tropical fruits do not ripen in the cold southern climate, they should be advanced in colour before harvesting.

Prices during the last week of July were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Smalls, 6s. to 12s. 6d.; Sixes, 9s. to 14s.; Sevens, 11s. to 15s. 6d.; Eights and Nines, 13s. to 16s.; bunch, 1½d. to 9d. dozen.

Sydney.—Cavendish: Sixes, 11s. to 15s.; Sevens, 14s. to 18s.; Eights and Nines, 17s. to 22s.

Melbourne.—Cavendish: Sixes, 11s. to 15s.; Sevens, 12s. to 17s.; Eights and Nines, 14s. to 18s.

Adelaide.—Cavendish: 16s. to 20s.

Brisbane.—Sugars, 1½d. to 5d dozen; Lady Fingers, 3d to 9½d. dozen.

Pineapples.

Brisbane.—Smooths, 3s. to 6s. case; 1s. to 4s. 6d. dozen. Roughs, 3s. to 5s. case; 4d. to 2s. 6d. dozen.

Sydney.—7s. to 10s. Some improvement showing in colour standards.

Melbourne.—8s. to 12s. Some fruit backward in colour.

Adelaide.—10s. to 13s. case.

Custard Apples.

Brisbane.—2s. 6d. to 6s. half bushel. Supplies short.

Sydney.—4s. to 7s. 6d. half bushel.

Papaws.

Brisbane.—Locals, 2s. to 5s. bushel; Gunalda, 4s. to 5s. bushel; Yarwun, 5s. to 7s. 6d. bushel and half.

Sydney.—6s. to 13s.; specials higher.

Melbourne.—10s. to 16s.; specials higher.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels, 5s. to 9s.; Commons, 4s. to 8s. bushel.

Melbourne.—Valencias, 6s. to 12s.

Mandarins.

Brisbane.—Emperor, 5s. to 10s.; Glens, 6s. to 12s.; Scarlets, 4s. to 9s. Ellendale, 8s. to 13s.

Sydney.—Good-quality Mandarins are selling at satisfactory rates, but Brisbane prices should be more payable with less risk.

Lemons.

Brisbane.—5s. to 11s. bushel.

Melbourne.—6s. to 10s. bushel.

Grape Fruit.

Brisbane.—3s. to 7s. bushel.

Melbourne.—7s. to 12s. bushel.

OTHER FRUITS.

Avocados.

Brisbane.—7s. to 9s. half bushel.

Strawberries.

Brisbane.—5s. to 9s. dozen boxes; some specials to 12s. dozen.

Sydney.—2s. 6d. to 5s. tray; 6s. to 12s. dozen boxes.

Passion Fruit.

Brisbane.—First grade, 6s. to 8s.; Specials to 11s.; Seconds, 3s. to 5s.

Sydney.—6s. to 8s.; specials higher.

Melbourne.—7s. to 10s. half bushel.

Tomatoes.

Brisbane.—Coloured, 5s. to 9s.; Ripe, 3s. to 7s.; Green, 2s. 6d. to 6s.

Sydney.—South Queensland: Coloured, 9s. to 12s.; specials higher; Green, 8s. to 9s.; Bowen, 5s. to 8s.

Melbourne.—Queensland, 7s. to 10s.; West Australian, 8s. to 15s.; Adelaide, 20s. to 24s. half bushel.

VEGETABLES.

(Brisbane prices only, unless otherwise stated.)

Beans.—Brisbane, 10s. to 15s. bag; poor lines lower; Sydney, 5s. to 10s. per bushel; Melbourne, 5d. to 8d. lb.

Peas.—Brisbane, 6s. to 11s.; Melbourne, 6d. to 9d. lb.

Cauliflower.—1s. 6d. to 5s. smalls; 5s. to 13s. dozen large sizes.

Cabbage.—2s. to 12s. dozen. Specials higher.

Carrots.—3d. to 1s. 6d. bundle.

Beetroot.—6d. to 1s. 3d. bundle.

English Potatoes.—2s. 6d. to 3s. sugar bag.

Sweet Potatoes.—2s. to 3s. sugar bag.

Cucumbers.—10s. to 12s. bushel.

Rhubarb.—1s. to 1s. 6d. bundle.

Celery.—Local, 9d. to 2s. 6d. bundle.

Chokos.—1s. to 1s. 6d. dozen.

Marrows.—Brisbane, 2s. to 5s. dozen; Sydney, 8s. to 9s. case.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of June, 1941 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Alfa Vale Midge (346 days)	W. H. Thompson, Nanango	17,878·75	672·478	Reward of Fairfield.
Newlands Empress 2nd (349 days)	J. F. Evans, Malanda	16,998·6	648·201	Greyleigh Sunbeam
Rosenthal Choice 15th (365 days)	S. J. H. Mitchell, Rosenthal	12,054·34	489·874	Rosenthal Musket
Trevlac Rosette	W. J. Freeman, Trevlac, Rosewood	11,600·5	489·675	Butter Boy of Railway View
Evansvale Bonnie 2nd	J. F. Evans, Malanda	10,972·45	471·070	Malanda of Glenore
Trevlac Fussy	W. J. Freeman, Trevlac, Rosewood	10,242	422·263	Butter Boy of Railway View
Braemar Billow	R. Ashford, Pittsworth	8,996·9	403·401	Braemar Keeper
*Ruby of Hawthorn	G. H. and E. E. Couchman, Warra	9,688·49	386·277	General of Croydon
Fairlie Fuschia 15th	C. B. Mitchell, Rosenthal	8,873·93	381·003	Fairlie Minor
	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Pineville Jean	A. C. Bell, Owens Creek, *via* Mackay	10,652·5	341·207	Arley Lorna's Renown
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Alfa Vale Model 11th (365 days)	W. H. Thompson, Nanango	17,096·2	748·195	Reward of Fairfield
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Trevlac Miss Hinkler	W. J. Freeman, Trevlac, Rosewood	8,907·5	386·257	Trevlac Hinkler
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Penrhos Peach 16th	Alex. Sandilands, Penrhos, Wildash	7,872·75	328·370	Rosenthal Surprise
Cedargrove Lady Sal 19th	P. D. Fiechtner, Pilton View, *via* Greenmount	8,415·5	308·597	Cedargrove Trump
Cedargrove Thelma 3rd	P. D. Fiechtner, Pilton View, *via* Greenmount	8,570·25	307·722	Cedargrove Winlad
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Alfa Vale Pansy (365 days)	W. H. Thompson, Nanango	16,236·7	745·518	Reward of Fairfield
Bingleigh Melody 11th	J. C. Meier, Bingleigh, Mount Mort	10,164·0	403·04	Blacklands Patrol
Blacklands Jinny 11th	Estate of P. Doherty, Box 31, Gympie	8,362·35	381·003	Parkview Vice-Roy
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Bingleigh Miss Jean	J. C. Meier, Bingleigh, Mount Mort	10,211·0	421·612	Blacklands Patrol
Fairvale Judy 5th	J. H. Anderson, Fairvale, Southbrook	7,151·58	310·154	Fairvale Czar
Agatha of Pinelands	R. Ashford, Pittsworth	7,620·24	301·489	Corunna Marshall
Trevor Hill Caramel	Geo. Gwynne, Umbiram	7,047·26	296·142	Corunna Supreme
Melba of Pinelands	R. Ashford, Pittsworth	7,582·62	272·063	Corunna Marshall
Pinelands Butterfly 2nd	R. Ashford, Pittsworth	7,023·15	262·021	Corunna Marshall
Faversham Dahlia 3rd	G. H. and E. Couchman, Warra	6,071·33	261·701	Faversham Rex
Trevor Hill Lilac (224 days)	Geo. Gwynne, Umbiram	6,430·36	243·742	Corunna Supreme

JERSEY.

Mature Cow (Standard, 350 Lb.).				
Langside Hurette's Hope	S. H. Caldwell, Walker's Creek, Bell	8,409·74	488·806	Masterpiece Yerribee of Brucedale
Lermont Duchess	J. Schull, Lermont, Oakey	7,838·9	467·694	Woodside Golden Volunteer
Oxford Best's Dolly	S. H. Caldwell, Walker's Creek, Bell	7,816·86	404·247	Oxford Best
Oxford Bowler's Dolly	S. H. Caldwell, Walker's Creek, Bell	7,185·86	384·773	Oxford Bowler
Brooklodge Garnet 2nd	J. Cummings, Upper Nerang	6,893·25	354·967	Pineview Model
Senior, 4 Years (Standard, 330 Lb.).				
Trecarne Jerseymaid 3rd	T. Petherick, Lockyer	7,386·25	408·926	Trinity Some Officer
Maylands Princess	J. R. C. Taylor, Rocksdale, Walkerston	7,341·9	317·550	Trinity Noble Crown
Junior, 4 Years (Standard, 310 Lb.).				
Oxford Pleasure	J. Sigley, Millaa Millaa	7,067·8	363·709	Oxford Golden Lad
Homesdale Glorious	J. Cummings, Upper Nerang	5,960·5	328·844	Homesdale Chieftain
Senior, 3 Years (Standard, 290 Lb.).				
Trecarne Sometot	T. Petherick, Trecarne, Lockyer	6,969·3	456·930	Trinity Some Officer
Trecarne Safety 2nd	P. H. Schull, Woodview, Oakey	6,355·3	360·454	Trinity Some Officer
Junior, 3 Years (Standard, 270 Lb.).				
Lermont Marigold	J. Schull, Lermont, Oakey	5,974·9	364·430	Woodside Golden Volunteer
Bellgarth Countess 2nd	D. R. Hutton, Bellgarth, Cunningham	5,790·44	317·661	Trecarne Renown 2nd
Palmridge's Florence	J. Sigley, Millaa Millaa	5,372·05	297·012	Oxford Jocular Lad
Junior, 2 Years (Standard, 230 Lb.).				
Lermont Madieraette	J. Schull, Lermont, Oakey	6,555·6	379·801	Woodside Golden Volunteer
†Fauvic White Bait	H. Cochrane, Fauvic, Kin Kin	6,326·1	319·724	Austral Park Sheik
Lermont Fairy Queen	P. H. Schull, Woodview, Oakey	5,877·7	319·299	Belgonia Lady's Duke 2nd
Trecarne Silver 5th	D. R. Hutton, Bellgarth, Cunningham	4,412·0	266·326	Trinity Some Officer
Trecarne Golden Dairymaid	T. Petherick, Lockyer	5,439·3	264·954	Jerseylea Golden Duke
Trecarne Peal 3rd	W. Griesheimer, junr., Leyburn	4,041·55	252·629	Jerseylea Golden Duke
Nairfall Marionette	J. Cummings, Upper Nerang	4,745·5	252·291	Nairfall Noble Basil
Carnation Peer's Fairy	D. R. Hutton, Bellgarth, Cunningham	4,304·28	241·744	Oxford Noble Peer
Nairfall Orange Lily	J. Cummings, Upper Nerang	4,514·05	240·61	Nairfall Noble Count
Trecarne Jersey Girl (244 days)	T. Petherick, Trecarne, Lockyer	4,838·6	240·240	Jerseylea Golden Duke
Lermont Melba	P. H. Schull, Woodview, Oakey	4,023·95	234·456	Lermont Major
Bellgarth Babette 4th	D. R. Hutton, Bellgarth, Cunningham	4,677·62	233·773	Trecarne Renown 2nd

* Ruby of Hawthorn (Australian Illawarra Shorthorn)—Please note amendment.

† Fauvic White Bait (Jersey)—Please note amendment.

General Notes

Staff Changes and Appointments.

Mr. C. V. Lilley (Lewis street, Camp Hill), has been appointed an Inspector under *The Diseases in Stock Acts*, *The Slaughtering Act*, and *The Dairy Produce Acts*, Department of Agriculture and Stock.

Mr. J. J. Purcell, inspector of stock, slaughterhouses, and dairies, Department of Agriculture and Stock, has been transferred from Chinchilla to Julia Creek.

Miss D. Mittelheuser and Mr. L. C. Kelso have been appointed assistant cane testers at the Babinda and South Johnstone sugar mills, respectively.

Mr. F. Caine, District Inspector of Stock, Cloncurry, has been appointed District Inspector of Stock, Brisbane.

Mr. J. Gunne, Inspector of Stock, Helidon, has been appointed District Inspector of Stock at Kingaroy, and Mr. S. J. Monaghan, Inspector of Stock, Boonah, has been appointed District Inspector of Stock, Cloncurry.

Mr. J. W. Garsden, clerk (Interviews), Bureau of Rural Development, has been seconded to the Chief Office of the Departmant of Agriculture and Stock for special duty.

The dates of appointment of the assistant cane testers to the Isis and Qunaba mills have been altered from 30th June to 30th July and from 28th July to 11th August, respectively, Mr. Anderson being the appointee at Isis and Mrs. M. E. Nally at Qunaba.

Mr. W. P. McGuire (Corbie, Curtis Island) has been appointed an honorary protector of fauna.

Constable I. R. C. Cooke (Kilkivan) has been appointed also an inspector under *The Slaughtering Act*.

The following have been appointed assistant cane testers for the present crushing season at the mills specified:—Messrs. L. E. Davies (Tully), J. Chalmers (Proserpine), J. V. Nowitski (Farleigh), L. V. Hoffman (Marian), C. A. Rehbein (Plane Creek), T. J. Donohue (Cattle Creek), B. G. Francis (Isis), and P. D. Crofton (Invicta); Misses P. O'Mara (Millaquin), J. Fisher (Inkerman), C. Jack (Kalamia), F. E. Noakes (Invicta), L. Oakes (Pioneer), E. J. Graham (Maryborough), T. H. Shield (Farleigh), C. Nielsen (Bingera), J. E. Ker (Marian), B. Thiele (Isis), and S. Crawford (Racecourse).

Miss M. Kleinschmidt (Beenleigh) has been appointed assistant cane tester during the current sugar season at the Pleystowe mill.

Mackay Quarantine Area.

A Proclamation has been issued under *The Sugar Experiment Stations Acts* declaring the Farleigh, Racecourse, Pleystowe, Marian, Cattle Creek, and North Eton mill areas to be a quarantine area under the abovementioned Acts in respect of the presence of downy mildew disease of sugar-cane. The nature of the quarantine to be imposed in the area shall be the prohibition of the removal of sugar-cane of any variety (except for the purpose of milling the same at the mill to which is assigned the plantation from which such sugar-cane is removed) from any plantation within the quarantine area which is downy mildew disease infested or has been so infested within three years of the time of such removal, unless the permission of the Minister has been granted for such removal.

Poultry Industry Regulations.

Regulations have been introduced under *The Diseases in Poultry Acts* to control the slaughter of poultry for sale for human consumption and the chilling of eggs. The regulations have for their object the supply of wholesome poultry meat and the protection of the quality of eggs that are submitted to the process of chilling.

The regulations governing the chilling of eggs further provide for the branding of such eggs.

The regulations governing the slaughter of poultry for human consumption will only apply in certain poultry districts which have been declared under the Acts. The poultry districts are Beenleigh, Brisbane, Caboolture, Coolangatta, Coomera, Cleveland, Fitzroy, Ipswich, Livingstone, Moreton, Nerang, Pine, Redcliffe, Rockhampton, Southport, Tingalpa, and Waterford.

Wheat Pool Election.

The State Wheat Pool Election Regulations, issued under *The Wheat Pool Acts,* have been amended to provide for optional preferential voting at future elections of growers' representatives on the State Wheat Board.

Banana Levy.

An Order in Council has been issued under *The Banana Industry Protection Acts,* providing for a levy on banana growers to be used for the maintenance of the Banana Industry Protection Board. The levy is similar to that issued last year, namely, 1½d. per case for bananas marketed in the case, and 2d. in the £ or part thereof for bananas marketed in the bunch.

Stallion Boards.

The following have been appointed members of stallion boards as hereunder specified:—

Darling Downs South Stallion Board.—Messrs. A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon, Department of Agriculture and Stock (chairman); J. H. Wall (Rockhampton), and T. MacDonald (Wooloowin).

Darling Downs North.—Messrs. R. D. Chester, B.V.Sc., Government Veterinary Surgeon, Department of Agriculture and Stock (chairman); J. L. Bowman (South Brisbane), and H. S. Handley (Pampas).

Central Coast.—Messrs. M. R. Irving, B.V.Sc., Government Veterinary Surgeon, Department of Agriculture and Stock (chairman); E. Cox (Paddington), and T. Turkington (Pilton).

Wide Bay and Burnett Boards.—Messrs. A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon (chairman); W. C. Jeffery (Miriam Vale), and T. MacDonald (Wooloowin).

West Moreton and East Moreton Boards.—Messrs. A. R. Nott, B.V.Sc. (chairman), and A. F. S. Ohman, M.V.Sc. (chairman), respectively, and D. Jackson (Teneriffe) and W. O. Scott (Taroom).

Canary Seed Slump.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock) has advised farmers to avoid canary seed as a cash crop for the coming season, as there is every indication of particularly low values ruling for this commodity for some considerable time. In recent years, he said, the area sown to canary seed had increased to an unwarranted extent, with the result that production had been in excess of market requirements. A complete collapse of the market had only been avoided by the action of the Government in guaranteeing the banking account of the Canary Seed Board. The Minister has appealed for the co-operation of Darling Downs farmers by refraining from producing unwanted canary seed, and so assist in preserving for themselves a valuable sideline industry.

Potash Shortage.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock) has announced the issue of an Order in Council under *The Agricultural Requirements Control and Conservation Act* further restricting the sale and use of potash for fertilizing purposes. This action was due, said the Minister, to the extreme difficulty experienced in importing supplies.

As previously prescribed, potash must still be sold in mixtures, but in the cultivation of tobacco the maximum percentage of potash is fixed at 6 per cent. for both sulphate and muriate. The quantity of muriate that may be present in any mixture is restricted, however, by fixing a maximum of 2 per cent. chlorine that may be present in any mixture.

For pineapples, the potash content may not exceed 10 per cent., and sulphate of potash, which is restricted to application during the second and third year of planting, may be obtained only by permit.

Cane farmers who were formerly obtaining up to 14.5 per cent. may now purchase mixtures containing a maximum of 10 per cent., and the 7.5 per cent. potash has been reduced to 6 per cent.

In fertilizer mixtures for vegetable crops, potatoes, citrus, deciduous fruits, papaws, custard apples, passion fruit, avocados, bananas, and strawberries, the maximum potash allowed is 6 per cent.

Potash may not be used on any crop other than those mentioned above.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

A Brachiaria Grass.

F.E.S. (Springsure)—

Your specimen was very interesting to us. It is a species of *Brachiaria*, but we have been unable to match it with any species in our native or exotic collections. We think the grass must be an introduction. Your note about its choking out mint weed is of great interest, as an allied grass, Urochloa or Liverseed Grass (*Urochloa panicoides*) has been found a most effective means of keeping mint weed in check on the Darling Downs.

Practically all the *Brachiarias* are excellent fodders, so that if any farmers or pastoralists feel inclined to gather seed from the patch in your district, they would be well advised to do so. Farmers have done this quite a lot with Urochloa seed on the Darling Downs, and this grass is now very widely spread. In the meantime, we should be very much indebted to you if you could send us an additional and larger specimen. Later on, if we can find out the specific name and the origin of the grass we shall let you know.

Wild Millet. A Love Grass.

B.H. (Dalby)—

Your specimen is not Urochloa grass, but is *Echinochloa colona*, commonly known as wild millet. This grass is very common as a weed of cultivation in Queensland, and one form occurs in rather wet, swampy country. It is generally regarded as an excellent fodder during the summer months, and is, in fact, closely allied to such well known cultivated fodders as Japanese millet and white panicum.

The smaller specimen is *Eragrostis poaeoides*, a species of love grass. This particular love grass generally occurs as a weed of cultivation, and is not regarded as of much value as a stock feed.

Log Wood.

D.McB. (Mackay)—

The specimen is the Log Wood (*Haematoxylon Campechianum*), a native of Mexico, but now found either cultivated or naturalised through the tropics. There are several trees of it in the Botanic Gardens, Brisbane. We have not heard before of the plant spreading in the way you describe, but think it is quite likely it would spread and become a pest, in the same way as *Acacia arabica* has, in some parts of North Queensland.

Carob Bean. Portuguese Elm.

B.S. (Kogan North, via Warra)—

The Carob Bean is a tree 20 to 30 feet high, with pinnate leaves. The flowers are mostly distinctly male or female, but sometimes hermaphrodite ones occur. They are small and insignificant. The pod is flattened, 3 to 4 inches long; the seeds are dark reddish brown, and are enclosed in a sweet sugary pulp. It is a native of the Mediterranean region, Southern Europe, Western Asia, and North Africa, but is now widely cultivated in most warm temperate countries. In past years the pods were largely imported into England as fodder for horses, and the best varieties were eaten as sweets or as substitutes. The Department has no seed on hand for distribution.

The Portuguese Elm is a spreading tree, deciduous for a very short period. The leaves are good fodder for stock. We think it would do well in your district. The crop is at present ripening on the trees at the Botanic Gardens, Brisbane, and we have put your name down on the list to receive a packet in about six or seven weeks' time.

Bundaberg District Specimens Named.

D.S., State School (Kolan North)—

1. *Dactyloctenium aegyptium*, Coast Button Grass. Native. Fair pasture grass.
2. *Axonopus compressus*, Broad-leaved Carpet Grass. Native of Southern United States. A fair pasture grass.
3. *Paspalum dilatatum*, Paspalum Grass. Native of South America. Very good pasture grass.
4. *Pennisetum clandestinum*, Kikuyu Grass. Native of Africa. Fodder valued comparatively high.
5. *Melinis minutiflora*, Molasses Grass. Native of Africa. Fairly high fodder value in tropics.
6. *Bothriochloa decipiens*, Pitted Blue Grass. Native. Fodder value low.
7. *Chloris Gayana*, Rhodes Grass. Native of Africa. Fodder value comparatively high.
8. *Eleusine indica*, Crowfoot Grass. Native of India. Occasionally eaten and only of medium value.
9. *Paspalum orbiculare*, Ditch Millet. Native. Fodder value slight.
10. *Themeda australis*, Kangaroo Grass. Native. Good fodder, particularly when young.
11. *Stenotaphrum secundatum*, Buffalo Grass. Native of South-Eastern United States of America. Fair pasture grass.
12. *Bothriochloa decipiens*, Pitted Blue Grass. See 6.
13. *Rhynchelytrum repens*, Red Natal Grass. Introduced from South Africa. Fodder value fair. Easily uprooted by grazing stock.
14. *Eragrostis leptostachya*, Paddock Love Grass. Native. Only of limited value as fodder; useful as constituent of mixed native pasture.
15. *Cenchrus australis*, Burr Grass. Native. Palatable only when young.
16. *Paspalidium* sp. Probably native. A fairly good fodder.
17. *Bothriochloa intermedia*, Forest Blue Grass. Native. Of limited fodder value.
18. *Paspalum paniculatum*, Russell River Grass. Native. Fodder value limited.
19. *Digitaria didactyla*, Blue Couch. Native of Mauritius. Good fodder grass, but quickly shows effects of drought.
20. *Cynodon Dactylon*, Common Couch. Native. Very good fodder grass.
21. *Sorghum verticilliflorum*, Wild Sorghum. Native of tropical Africa. A fairly good fodder grass.
22. *Heteropogon contortus*, Bunch Spear Grass. Native. Of fodder value only when very young.
23. *Echinochloa colona*, Wild Millet. Native of India. A very good fodder grass.
24. *Hyparrhenia filipendula*. Native. Fodder value very limited.
25. *Digitaria adscendens*, Summer Grass. Possibly native of tropical America, Fodder value fair to good.
26. *Chloris virgata*, Feather Top Rhodes Grass. Native of tropical America. Fodder value very limited.
27. *Brachiaria mutica*, Para Grass. Probably native of Africa. Good fodder grass.
28. *Axonopus affinis*, Carpet Grass. Native of Southern United States of America. Fodder value limited.

"Horse Radish Tree."

A.A.F. (Cloncurry)—

1. *Moringa oleifera*, Horse Radish Tree, a native of India. This plant is very widely used in India; the leaves as a substitute for horse radish, and the unripe pods as a green vegetable and substitute for asparagus. We think this is eaten freely enough by horses, but have not heard of its causing any trouble.
2. *Alysicarpus rugosus*, a native legume and one of the most valuable fodders of North-western Queensland. We have not heard a common name for it.

Sarsaparilla.

K.E.K. (Cooroy)—

The true Sarsaparilla is ***Smilax medica,*** a native of Mexico. It is a large vine with prickly stems, heart-shaped leaves, very small insignificant flowers, and red berries. The plant you describe is a totally different one, and in no way related to the true Sarsaparilla. It is ***Hardenbergia monophylla.*** The roots have a sweetish taste, and have been used as a substitute for Sarsaparilla in the manufacture of beverages.

We have in Australia several species of *Smilax,* one of which, *Smilax glycyphylla,* is common both in Queensland and New South Wales. This plant is frequently collected as a source of sarsaparilla, and is largely used in New South Wales in the manufacture of soft drinks and cordials. We have the same species here, but it seems to lack the sarsaparilla taste.

VETERINARY ADVICE.

(*Selections from the outgoing mail from the office of the Director of Veterinary Services.*)

Cattle Tick Control.

C.W.G. (Gladstone)—

1. Can ticks attached for fourteen days be killed in any arsenical dip?

Answer.—Ticks of this age are readily killed by dipping in an arsenical dip. It was at one time considered that nymphal ticks at the time when they were moulting to the adult stage (14-16 days old) were resistant to dipping because they were protected by the cast off nymphal skin, but this has since been disproved. Eradication campaigns always use 14-day intervals between dippings. The results in the United States show how effective such an interval can be.

2. Will arsenical dips kill all stages of ticks?

Answer.—No arsenical dip of the usual strength (0.2 per cent. arsenic) is 100 per cent. effective. A few ticks of all stages may escape. Adult female ticks which are fully engorged (19-35 days old but usually 24 days old) or which are 3-4 days off full engorgement are, however, considered to be more resistant to dipping than other stages.

3. Is it a fair test of the efficiency of a dip to remove ticks 10-15 minutes after dipping, place them in a match box and see how long they live and whether they will lay eggs?

Answer.—Yes, and such a test is always used by us when testing a dip, except that we consider that only the larger semi-engorged to engorged female ticks should be used. Nmyphs and young adult females, even when undipped, will die in a few days after removal from cattle. Tests of the effect of a dip upon ticks involves placing these dipped females under favourable conditions—they are very susceptible to lack of moisture—and seeing how long they live, how many eggs they lay, and whether these eggs hatch, and whether the larval ticks that hatch from the eggs are strong and active. Dipped females frequently lay eggs which do not hatch. In such an instance, the dip is considered efficient.

As regards the large ticks still showing life after 5 or 6 days, it is possible that some of these have been so affected as to lay eggs which do not hatch. Others, of course (see answer to Question 2), may be only slightly affected and will lay quite normal eggs.

4. How is the tick killed?

Answer.—This is a very controversial point. Some observers believe that death occurs through absorption of arsenic through the tick's skin. Others believe that the tick sucks in arsenic from the animal's skin into which the arsenic is absorbed after dipping.

5. Intervals between dipping for tick control?

Answer.—For purposes of control one should dip cattle at such intervals that the larvae picked up between dippings are not permitted to remain long enough on the animals to become fully engorged females and then drop off and lay eggs. The minimum period recorded for cattle tick larvae to reach this stage is 19 days. In practice for eradication work, 14-day intervals are used. If periods longer than 19 days are used, many ticks will be dropped off and laid eggs in between dippings. This would, of course, tend to prevent complete control.

Rural Topics

Saving Our Soil.

It is remarkable how interest in soil erosion, or, rather the means of preventing loss of farm fertility, is spreading throughout Australia and we seem to be becoming more soil-minded every day—it may be that our "soiled" conscience is biting us! Still, it is no use continually harping on the causes of soil erosion, and we have simply got to give more thought to the remedies—the practicable remedies within reach. Yet there is no one remedy, or combination of remedies, suitable for working on in every district. What may be good round about Kingaroy would not, perhaps, do the job so well in the country below the Range or along the North Coast, or in the heavy rainfall regions up above Townsville. There are, however, fundamental principles of soil conservation that do apply over a wide diversity of conditions. For instance, we are thinking more about the wider use of close-growing grasses and legumes like lucerne which are proving effective soil savers over many different classes of country. World experience shows, generally, that most soils must have the benefit periodically of close-growing grasses to maintain fertility and structure.

Many of our ideas are now being applied in general practice—such as the use of grasses and legumes, improved crop rotations and so forth—but what is needed most of all is to get away from "square farming in a round country." That means contour cultivation and, where soundly practicable, strip-cropping; under this system each furrow acts as a dam to any serious run-off during every shower of rain. But, perhaps, most important is the fact that under this new practice, the right crop is grown in the right place. In other words, cultivation conforms to the lay of the land.

Wind and water, of course, respect no boundary fence and adequate soil conservation in any district can only follow whole-hearted understanding and backing of all the people concerned. And apart from this neighbourly co-operation in the prevention of soil erosion, safeguards can be established more economically through farmers working together.

Beauty Bosses the Beast.

Here is a good story from England, where the Women's Land Army are doing excellent work in country districts: At a dairy farm where land girls were training, milking was naturally part of the ordinary daily course. After awhile they passed out to farm employment and the men (over military age) came back to the cow bails. In a few days the cows seemed to be animals with a settled grievance; they were holding back their milk; the men could do nothing with them: the milk yield was dropping, and the dairy farmer was wondering what it was all about.

His wife, however, put things right. At her suggestion the men sprinkled a little scent in their overalls; they trimmed and painted their finger nails and made up their lips and faces. Result (believe it not): Milking became a joy and yields rose up a gallon a day!

New Uses for a Vacuum Cleaner.

In the countryman's session (the Australian Broadcasting Commission, Regional Radio Stations) recently, Dr. Montgomery White, agricultural chemist, who also is an authority on animal nutrition, said something about getting show animals ready for exhibition. He expressed the opinion that hosing of animals under strong water pressure is not always an advantage. The experience is often new to the animals, and a strong-pressure hose turned on them might actually stop them from settling down in their strange surroundings at the showground. Of course, most stockmen have their own ideas on the preparation of a show coat on a beast. Much depends on the season—that is, how the winter coat is shed, the country, how the animals have travelled, and so on. Coal dust or grit, for instance, is not easy to get out from a very mossy-coated animal, and days of shampooing, combing, and beauty-parlour treatment are necessary. Dr. White suggested that an ordinary vacuum cleaner would be very handy at the showground to run over the coat of a beast, the same way as it is run over a carpet. Several show cattle men have written commending Dr. White's idea, and this is what one stud breeder says: "I think your idea of a vacuum cleaner for show stock is top-hole. As a matter of fact, I use one for defleaing my dog."

That way of defleaing a dog is a bright idea, and might commend itself to any Digger who has had the experience of many hours "reading his shirt!"

Man's Trinity of Responsibilities.

Without flippancy and with all reverence, it is suggested in a recent issue of *Citriculture* (California) that if Moses had foreseen man's woeful misuse of land in every country and in every age—the wastage of soil by man's suicidal agriculture and the resulting man-made deserts and ruined civilisations—if he had foreseen the desolation caused by man's ignorance or greed or both, Moses, no doubt, would have been inspired to amplify the Ten Commandments to ensure man's understanding and observance of his trinity of responsibilities—his responsibility to his Creator, his responsibility to his fellow-men, and his responsibility to Mother Earth. Such an amplification might have been given in these words—

> "Thou shalt inherit the earth as a faithful steward, conserving its resources and fertility from generation to generation. Thou shalt safeguard thy fields from soil erosion, the living waters from drying up, thy forests from desolation, and protect thy country from overstocking or overgrazing, so that thy descendants shall never be deprived of their abundance."

Lucerne for Grazing Land.

Down in the southern States the practice of sowing lucerne in grazing paddocks is arousing widespread interest. In suitable soils and under a rainfall as low as 14 inches, lucerne sown in pasture has exceeded all expectations in parts of the eastern Riverina country. Although winter rains are the rule down there, occasional summer falls have even provided a cutting for hay as well as a constant nibble for stock throughout the summer. Of course, local conditions have to be right. Lucerne, of course, should have a suitable seedbed and it must get a good start. So, before doing anything on a large scale or going to any considerable expense, anyone who is inclined to give lucerne a trial on the same lines followed, with some success, by graziers in the South would naturally make a test sowing at no appreciable cost. If the trial fails, one is not much out of pocket, and if it succeeds, well, a lot of useful information has been gained. With lucerne, we know that with a fairly good strike followed by favourable spring weather, it is possible to get something like a good stand, except, of course, on shallow, clayey soils. Two pounds of seed to the acre is recommended for grazing purposes. In the Mallee country in Victoria it has been found quite practicable to establish lucerne under cover of a light seeding of wheat. Once lucerne is established, it is well known that it must be given fair treatment if it is to give good results. We have all seen many a good grass and much useful herbage eaten right out in dry times, because of overstocking for too long a period.

Blowfly Strike Control.

And while on wool, it is good to know that a Commonwealth-wide campaign for blowfly strike control has been planned on lines that should lead to a good win in the fight against the worst of our pastoral pests. By new methods, it is anticipated that the incidence of blowfly strike can be reduced by as much as 80 per cent. What is known as the Joint Blowfly Committee, which is working under the direction of the Council for Scientific and Industrial Research and the various veterinary services, has been testing out the value of methods such as jetting, correct lamb-marking, breeding plain-rumped sheep, and so on. Although some definite conclusions have been arrived at, there remains the difficulty of carrying them very far beyond the experimental stage. To bridge the gap between the work of the science man and its application by the practical man, schools of instruction for agricultural extension officers are about to be started in the South. At the end of the instructional term, the extension men will carry on with a campaign of demonstration, so that flockowners will be able to see methods of checking blowfly strike in their sheep in actual application. Personal contacts and showing just how a job should be done make up the best form of publicity in these matters.

A New Kind of Scarecrow.

On a farm in Kent (England) dressmakers' models are being used as scarecrows. The farmer bought them at a low price at a blitz salvage sale, and he says they do their job of scaring birds from growing crops, especially in the cabbage fields, wonderfully well.

From what we can remember of old-fashioned dressmakers' dummies they'd scare anything, whether bird or beast, out of a paddock. It would be interesting, however, to know how one of the beautiful life-size models so conspicuous in drapers' show windows nowadays would act as a scarecrow! The very reverse, probably, for a crow or any other "bird" would certainly be attracted by their grace and beauty!

Papaws and Wool.

Whoever would have associated papaw growing with the pastoral industry, but there it is. While we all deplore war, the fact is that it forces us to set our wits to work in all sorts of ways. The tremendous demand for unshrinkable wool for clothing for our fighting men has started studies of every possible or practicable process that would lead to stopping shrinkage in woollen goods. A lifeline for the wool industry after the war may be provided, we are told, by two remarkable developments—an anti-shrinkage process, and the taking of the "tickle" out of woollens. Both these things have been done with an extract from the Queensland papaw. It is believed that when military requirements cease to be our first consideration, these developments will tremendously strengthen the position of wool in the textile world.

The anti-shrinkage process is regarded as of special importance to pastoralists with merino flocks, because it not only permits woollens to be washed like cotton garments, but gives finer wool a greater range of usefulness. The process is developing amazingly in army clothing manufacture, and so will be ready for immediate application to normal trade purposes when the war is over. Every week 500,000 pairs of socks for the Services are being treated at a cost of only a penny a pair. The process, which is called the enzyme process, gives a silkiness and softness to woollens which has never been known before, and great things are expected from it when peace returns.

Incidentally, it provides a very interesting example of the interlinking of one primary industry with another—pastoral and horticulture. Papaws are certainly appreciated by the "inner man" and now by the "outer man" as well. Still, no one has ever thought before of associating a papaw with a "Jacky Howe," or, say, fruit salad with a flannel shirt.

Sunflower Oil.

Oil extracted from a sunflower crop grown in the Warren district of New South Wales is said to be more valuable than the best imported Italian olive oil. Trial plots of sunflowers sown with several varieties have produced very satisfactory results. One crop under irrigation had flowers as large as 12 inches in diameter. Besides watering, the ground had been ploughed deeply several times and treated fairly heavily with superphosphate.

For the sunflower, it is said, that after the oil is extracted from the seed the residue can be used as stock feed, and the fibre of the plant itself is suitable for making strawboard.

It is well known that sunflower seed is very fattening, so it would be wise to keep it away from laying hens.

The sunflower is a heavy feeder, so it would be necessary to plant it only as a rotational crop to give the soil time to recover from the heavy drain it makes on it.

A Novel Plough Attachment.

An original mouldboard plough attachment, which combines a disc and rolling coulter and fixes to a plough by a special arm, has been recently introduced in the United States. The attachment cuts all heavy trash and assists the plough in working it under. The manufacturers claim that this new attachment makes for high-speed ploughing without the help of extra labour and without the loss of time entailed in cleaning a plough which otherwise clogs from time to time.

Experience Teaches.

The opportunities now open to the youth of Australia of obtaining some insight into the underlying principles of agriculture, enabling them to make more and better use of experience, is bound to have its effects on the coming generation of farmers who will not only be anxious to adopt new methods with new ideas, but will realise the importance of business principles in farming.

What We Owe to Posterity.

Here is something we can all paste in our hats:—There is a debt to posterity which is owed by every owner of agricultural land. On him rests the responsibility of leaving to his successors his land in as good condition as it was when he turned his first furrow—even in a better condition, if possible. Anyone who does not do everything in his power to prevent his soil from washing away or losing fertility can hardly expect to be held in happy remembrance by those who have the misfortune to follow on in the cultivation of a misused and worn-out farm.

Farm Notes

SEPTEMBER.

WITH the coming of warmer weather, weeds of all kinds will be making their appearance on cultivated land and among row crops, but in the latter case they can be effectively dealt with by inter-row cultivation, and, where necessary, by the use of the hoe.

Where crops are sown on thoroughly fallowed land, the greater freedom from weed infestation is at once apparent when compared with adjacent paddocks which have merely received a hurried preparation, so that sowing clean seed on clean land may be amply rewarded in the resultant clean crops and higher returns.

Potatoes planted during July and August should now be making growth, and should be sprayed with Bordeaux mixture as a preventive of blight, particularly if cool, moist weather is experienced. Bordeaux and Burgundy mixtures are not regarded as a cure for blight, but the spray forms a satisfactory protective covering, which, if applied at intervals during growth, will effectively prevent the disease. Where land has received adequate preparation, forming a satisfactory seed-bed, and has a sufficiency of sub-surface moisture to induce germination, early sowings of maize, sorghum, sudan grass, millets, cowpeas, and pumpkins and the planting of sweet potato cuttings may be proceeded with, the farmer's chief concern being to provide a sufficiency of summer-growing fodder and grain crops both for current needs and for storage as seasonal reserves.

The spring maize crop is usually considered as uncertain for grain production, as the warm, moist conditions required during the tasselling period do not always occur, but as excellent crops are sometimes obtained the risk is well worth while, especially as the fodder provided can always be put to good use in the event of a failure for grain.

Early-maturing Yellow Dent varieties—such as Funk's 90-Day and Early Leaming—will be found the best for early sowing, as they have the capacity of making the best use of available moisture.

During this month attention should be given to first sowings of quick maturing forage crops, such as panicum and millets and Sudan grass, to meet the need for green feed urgently required following a winter period.

Market prices also are a consideration, for although early sown maize is usually intended for farm use, any surplus can be disposed of at higher prices than may be obtainable for the main crop at a later date.

Sweet potato cuttings will now be obtainable, and attention is directed to this valuable crop, which will thrive over a much greater range of climatic and soil conditions than the English potato. There is scarcely a farm throughout the State which would not benefit from a patch of sweet potatoes, for either culinary use or stock-feeding. They are not always profitable as a market consideration, but improvement in this direction is possible if well-graded tubers of suitable cooking varieties only are offered.

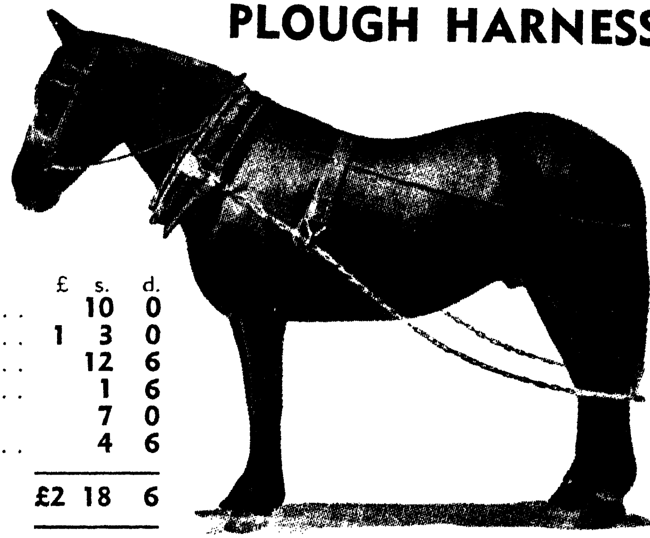
AUSTRALIAN REAPERS FOR THE BRITISH HARVEST.

Here is an interesting item of news from Britain, and it shows that Australia is not only contributing strongly and effectively to the defence of the British Commonwealth, but also the production of food in the Old Country. Australian reapers and binders are now being delivered in Britain to assist in harvesting Britain's greatest crop of the twentieth century.

More than 4,000,000 acres have been added to cultivated land in the last two years, requiring 100,000 tractors and an immense amount of new machinery which is arriving from Australia, Canada, and the United States. Schoolboys and university students, as well as men and women, will lend a hand in gathering the abundant crops.

Unbeatable Value! PLOUGH HARNESS

PRICE PER SET £2/15/-



	£	s.	d.
Winkers . .		10	0
Collar . .	1	3	0
Hames . .		12	6
Straps . .		1	6
Backband		7	0
Chains . .		4	6
	£2	18	6

Write for our Illustrated Catalogue

JAMES SMITH & SON

STANLEY STREET, SOUTH BRISBANE, S. 1

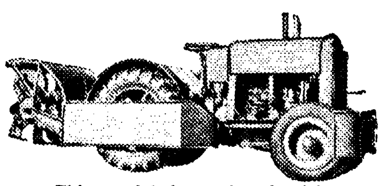
FOR HIGHEST RETURNS

cultivate with a

HOWARD

AUTO-ROTARY

HOE "22"



This model is equipped with pneumatic tyres which are optional.

READ WHAT USERS SAY ABOUT THE "HOWARD"—the machine that gives complete cultivation in one operation.

"After 2½ years, it is giving me every satisfaction. Working on land tightly bound with paspalum and land very stumpy, it has loosened up the soil where no plough could work, and the carrying capacity is doubled."

"I have been using a Howard Auto Rotary Hoe for four years. My working costs have been cut down more than 50 per cent. The soil is in better condition than it was when working with horses, and my trees have cropped 30 per cent. better."

Write for full details about the Howard "22" and the Howard "12."

A.S.A. FARM MACHINERY Pty. Ltd.

76 EAGLE STREET, BRISBANE

Lend to Defend—Buy War Savings Certificates.

Orchard Notes

SEPTEMBER.

THE COASTAL DISTRICTS.

IN the North Coast and Gayndah districts most of the citrus crops have been harvested, with, perhaps, the exception of Valencia Lates. Orchard work this month includes pruning, cultivation, fertilizing, and spraying. Some trees may be showing signs of impaired vigour, and these will require a severe pruning, both in thinning and shortening back, removing superfluous growths and diseased and weakly woods. Healthy and vigorous orange trees will require little attention beyond the removal of crowded lateral growths.

Mandarins will need special treatment, particularly Glen Retreats and Scarlets. These varieties usually produce a profusion of branches, and as the trees mature the growths harden and the fruit-bearing shoots make short, weakly growths, which usually result in an over-production of small fruits and a weakening of the trees. This is noticeable particularly in the case of the former variety, for which the annual pruning should consist of a heavy thinning and shortening back. Mature mandarin trees require attention towards assisting them to produce new and vigorous fruit-bearing growths.

Unprofitable trees should receive attention and be prepared for top-working. They may be headed back to three or four main arms radiating from the stem and whitewashed to prevent bark scald. Such trees may be grafted or later budded when suitable growths have matured.

Before working up the soil, fertilizing should receive attention. The spring application should carry a high percentage of nitrogen.

In the warmer districts, which are free from frosts, plantings of young trees may be made. Serious consideration should be given only to the selection of commercial varieties and, having due regard for local conditions, selections may be made from the following varieties:—Washington Navel, Joppa, Valencia Late, Beauty of Glen Retreat, Emperor, Beauty of Ellendale (irrigation areas), Marsh Seedless or Thompson grapefruit, and Villa Franca, Lisbon, Eureka, and Genoa lemons.

Where melanose and black spot are present in orchards, preparations for control measures should be made and Bordeaux sprays applied at the correct times.

Most citrus trees would benefit considerably by the application of a strong lime-sulphur wash, 1-18.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

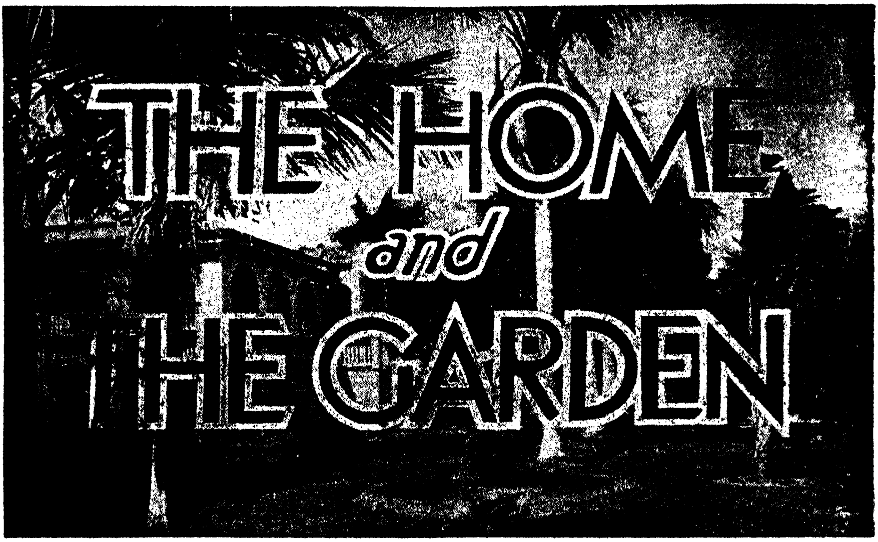
BLACK aphis should be attacked wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty. If these very destructive insects are kept well under control, the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working-over of undesirable varieties of fruit trees may be continued. The pruning of grape vines should be done during this month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture, but also act as a harbourage for many serious pests, such as the Rutherglen bug.

New vineyards may be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer localities suitable for the growth of citrus fruits, the land should be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

Fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this swarm of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

COLD WEATHER AND THE BABY.

"HERE we go round the mulberry bush on a cold and frosty morning." Who does not remember that old nursery rhyme with its picture of happy, healthy children playing active games in the cold, keen air of an English winter? And could there be a more sensible way of keeping warm on a cold day? In Queensland we do not have very many "cold and frosty mornings," although on the Downs and over the western plains the cold can be severe while it lasts, and even on the coast we have some cold, grey days. Generally speaking, however, the winter season in Queensland is short, and although the early mornings and nights may be cold the days are usually warm and sunny. The westerly winds make most of us feel uncomfortable, but they do not continue for long.

Nevertheless, even in our short period of cold weather, babies and children do need special care, and it is well that we should consider what that care implies. We must remember at the same time that to hardy, active people of any age, cold is invigorating. Only to those who are sick, weakly, or coddled is cold weather likely to become a source of harm.

Feeling the Cold.

Like the grown-ups, children differ from one another and some feel the cold more than others. These should be treated accordingly, whilst at the same time everything possible should be done to tone them up and improve their circulation and general health.

Children suffering from lack of warmth will be miserable, fretful, and listless. They tend to sit about huddled up much as our pet cats and dogs lie curled up in order to conserve the natural warmth of their bodies.

The Skin.

Most people know that the skin of our bodies is a protection against injury, but few realise that it also plays a vitally important part in regulating heat. We all know that if we do not use our muscles they become soft and toneless; in the

same way the skin, if not exercised and developed, is unable to take its share in building up the power of the body to withstand changes of temperature. If a child is over-clothed and coddled this function of the skin becomes impaired, the movements of the body are impeded, and he feels every change of temperature and suffers in consequence.

Clothing.

The intelligent mother is careful to clothe baby in accordance with the changes of temperature that occur, not only from day to day, but from one part of a day to another. When the young child wakes early on cold mornings and wants to sit up in bed and play, it is a wise plan to remove any wet garments and put on dry ones covered by a warm gown or jacket.

When the sun rises and the morning becomes warmer he will usually be comfortable and happy on a rug or old blanket in his play pen, or in a sunny corner of the veranda which has been enclosed for him.

In choosing baby clothing for cold days, we must remember that although knitted garments are best and warmest in still air, they are not sufficient protection in windy weather, and one thickness of closely woven material, such as flannel or silk, is necessary when baby is outdoors on windy days.

The baby who has reached the crawling stage may be a problem in cold weather, as his feet, legs, and hands may become badly chilled as he crawls around among all the draughts on the cold linoleum. He requires a suit of closely woven or knitted woollies covering feet and thighs. Mothers can easily make good crawling suits for baby by using the tops of old woollen stockings, old woollen bloomers, and jumpers. Do not make the mistake of keeping him in his cot all the time just because the weather is cold. The exercise of crawling will warm him up, provided he is suitably clad.

During the warm hours in the middle of the day remove unnecessary woollies, but as the day wanes be ready with extra wraps.

This attention and watchfulness is common sense—not coddling; but it should be carried out quietly and naturally, taking care not to fuss over the child or make him feel that you are anxious about him. For the one casual mother who carelessly allows her baby to become chilled by unsuitable or insufficient clothing, there are many others who, by remarks such as, "Billy, put your jersey on at once or you will get your death of cold," and by incessant fussing over a little chilling or wetting, are doing their best to create the neurotic individual we have all met who visualises an attack of rheumatic fever or pneumonia every time he gets a wetting or forgets his overcoat on a cold day.

Remember that busy and active children whose skins are "doing their job" will not feel the cold like their parents, whose movements may be slower and their occupations less energetic. It is quite easy to tell by his appearance and general behaviour when a child is cold, and there is no need to fuss over him.

Ventilation and Sunlight.

Even in Queensland, with its equable climate, we sometimes find babies and children in rooms that are poorly lit and badly ventilated. Winter is the time when we can use our lovely sunshine to the full, because there is so little danger of burning, and real sun baths can be given to baby, provided a suitably sheltered spot is chosen. Verandas are particularly useful, and when situated on the sunny side and protected from winds they provide excellent sleep-outs for babies and children even on the coldest days. If you must keep baby in a room, see that it is well ventilated and sunny. To ventilate a room properly it is necessary to have a moving current of air, say, between two windows or a window and a door. Baby's bed can be placed out of the direct draught.

Winter colds are not caused by cold air but by being shut up in badly ventilated rooms, particularly when people are present who have colds or are carrying in their throats and noses the germs of other diseases.

Ventilation provides us with a means of dividing up or diluting germs that may be present in the air. If these germs are sufficiently diluted with pure, fresh air they become harmless. Remember, colds and whooping cough and measles are not caused by chilling, but by germs which are sprayed into the atmosphere by the coughing or sneezing of infected persons. Keep your windows open and drive them away.

Babies and young children should not be taken into crowded buildings or kept out so late that they have to travel in crowded trams or buses with the windows shut. Also, they should be kept away from children suffering from colds and other infections.

Exercise.

As we explained in our nursery rhyme at the beginning of this talk, the natural way of warming the body is by exercise. Let the children play out of doors and go for walks on the cold days. Even wet weather does not harm them if they change clothes and shoes when they come in. Do not send children out without hats, particularly in windy weather, and the panties of both girls and boys should be of woven material and reach almost to the knees, so that the thighs are warm.

Diet.

Mothers often ask whether they can give their children anything that will prevent them "taking cold," and we always answer that the best protection against any disease is an all-round good diet. The young baby is fortunate in having provided for him by Nature his mother's milk, which is his best protection against disease. The older child who gets plenty of fresh air and sunshine and eats every day a good quantity of the "protective" foods—milk, butter, eggs, vegetables, fruit, and wholegrain porridges and breads—should have a very good resistance to colds and other infections.

If a child is weakly or seems to take cold easily, cod-liver oil in some form may be given during the cold weather in addition to the foods mentioned.

You can obtain further advice on this or any other matter relating to the feeding and management of children up to school age by writing to "Baby Clinic, Brisbane." Such letters need not be stamped.

IN THE FARM KITCHEN.

POPULAR DINNER DISHES.

Baked Cabbage.

Shred a fairly large cabbage finely and soak in cold salted water until crisp. Drain well and put in a large saucepan with a tablespoon butter, pepper, and salt to taste. Cover well with a tight-fitting lid and cook until tender. Stir now and again during the cooking to prevent burning. Allow to cool, then add 2 well-beaten eggs, 1 tablespoon shredded and fried bacon, a little grated nutmeg. Well grease an ovenproof dish or basin and sprinkle thickly with brown breadcrumbs. Fill centre with the cabbage and cover with more breadcrumbs. Bake in a hot oven for half an hour, turn out and serve with brown sauce or as a vegetable to serve with roast meat.

Baked Apple Roll.

Sift ½ lb. plain flour with a good pinch salt. Make a bay in the centre, add the yolk of 1 egg and 1 whole egg and enough warm water or milk to form into a smooth dough (about one-third cup). Add 1 oz. melted butter and beat dough until smooth and until it does not stick to the hands. Place dough on a clean floured tea towel, cover with a basin, and allow to stand in a warm place for half an hour. In the meantime peel, core, and slice 6 or 7 large apples, put in a basin, and sprinkle with sugar, add 1 tablespoon brandy, mix well together, and cover until required. Melt 3 tablespoons butter or good margarine in a saucepan, add 4 oz. fine white breadcrumbs, and fry until lightly browned. Wash and dry 6 oz. sultanas. Roll dough into an oblong piece about 12 inches by 18, rolling it as thin as possible. Sprinkle the cloth with a little more flour, place the rolled dough on this and pull the paste from side to side until it is almost transparent. If any thick patches of dough remain, pass the hand underneath and work gently until thin without breaking the dough. The dough should be about 2 feet by 3 feet. Distribute the thinly-sliced apple all over the dough, then sultanas, a little melted butter, then a little sugar and ground cinnamon; rub about 4 tablespoons apricot jam through a sieve and add 1 tablespoon boiling water. Add to this apple, &c., and spread it as evenly as possible. To roll the dough, hold the cloth from one side and raise both ends gently so that the dough, &c., will roll itself into a thick roll. Place on a greased baking dish, brush over with melted butter, and bake in a moderate oven for about 45 minutes.

Wheatmeal Custard Tart.

Cream 3 oz. butter and 3 oz. sugar together until light and fluffy. Gradually add 1 tablespoon water to which is added a few drops egg-yolk colour. Sift 6 oz. plain flour with ½ teaspoon baking powder, a pinch salt, then add 2 oz. fine wheatmeal. Roll out and line a sandwich tin about 6 inches in diameter. Beat 1 large egg slightly, add 1 dessertspoon sugar, vanilla, and 1 cup milk; bake in a moderate oven until custard is set and pastry brown.

Baked Rhubarb Pudding.

Stew 1 bunch rhubarb in the usual way, using as little water as possible. Remove the crust from stale white bread and weigh 1 lb. Cover this with just enough milk and when quite soft squeeze out until almost dry. Mix this with 2 oz. finely-grated suet, 2 oz. sugar, and 1 beaten egg. Line a well-greased round cake tin with this mixture, reserving enough for top. Fill with rhubarb, then cover with the remaining bread mixture. Bake in a moderate oven for 1½ hours. Turn out carefully and serve hot.

Curry and Rice.

Cut up cold meat into dice and springle over 1 tablespoon curry powder to each 1 lb. cold meat. Melt 1 tablespoon good dripping in a pan and fry meat until a golden brown, or, if liked, a dark brown. Peel and slice 1 lb. onions and ½ lb. chopped apples and fry them also. Add to meat and enough stock to cover. Simmer for 2½ hours. Skim well and add lemon juice and 2 sliced bananas and simmer for 6 or 7 minutes. Dish up in a border of well-boiled rice.

IN THE FARM GARDEN.

A CHEAP FERTILIZER.

The garden compost heap is a cheap means of converting garden and household vegetable refuse into valuable fertilizing material. Materials such as lawn clippings, spent crops free of disease, and vegetable tops should be used in this way, but the coarse, woody stalks of strong-growing plants should be avoided.

The production of artificial manure from garden waste, straw, &c., depends on the decomposition, by fungi and bacteria, of much of the plant material. The rapidity with which the process goes on is influenced by the type of material, its degree of maturity and chemical composition, and by the presence of nutrients, such as lime, phosphate, nitrogen, and potash for the organisms carrying on the decomposition are much akin to plants in their requirements.

Actual damage can be done to crops, other than some legumes, by the addition of uncomposted, poor-quality material to the soil. Such materials as bush scrappings, dry mature grass or straw, offer a good source of energy for the soil bacteria and fungi which rapidly increase in numbers, and in so doing consume some of the available nitrogen. This competition between the plant and the soil organisms for soil nitrates may result in the nitrogen starvation of crops.

The usual process of allowing plant refuse to decay, without any chemical treatment, results in a very acid product. With plant residues containing little nitrogen and phosphate, it is necessary to add available nitrogen to the heap as well as lime (which prevents the development of acidity) and phosphate (which is required in the nutrition of the organisms). With materials rich in nitrogen and minerals, such as legumes (peas, beans, &c.), green vegetable tops, and other green succulent material the use of lime alone should be sufficient to ensure rapid decomposition.

With general refuse or poor-quality material, a heap can be made on a square base and of such size that the final height is about 3 feet. The chopped-up material should be spread in layers several inches deep, each layer being treated in the following way:—

Snow over with ground limestone (5 lb. per 100 lb. of material), fork in loosely, give a sprinkling of superphosphate, and then add sulphate of ammonia at the rate of 1½ lb. per 100 lb. material. The material should be moistened before building up the layers, if not already moist. Ammonia will be given off slowly, so that it is necessary to keep building up and treating the successive layers quickly, in order that the loss will be kept at a minimum. The final layer is not treated, and may be given a covering of an inch of soil. When next the heap is added to, the untreated layer can be moistened and treated.

When the heap is at its full height, after subsidence due to compaction and bacterial action, the untreated capping can be used as a base for the next heap. The heap should be kept damp, but the amount of water used should not cause draining from the heap.

In summer the material should be ready for use after two months, but in cold weather the process is much slower.

Properly prepared, compost manure is very similar in chemical composition to horse manure, and gives equally good results in promoting plant growth.

ASTRONOMICAL DATA FOR QUEENSLAND

SEPTEMBER, 1941.

By A. K. CHAPMAN, F.R.A.S.

SUN AND MOON. AT WARWICK.

Sept.	SUN. Rises.	SUN. Sets.	MOON. Rises.	MOON. Sets.
	a.m.	p.m.	p.m.	a.m.
1	6.6	5.38	1.22	2.14
2	6.5	5.39	2.21	3.8
3	6.4	5.39	3.19	3.57
4	6.3	5.40	4.17	4.43
5	6.2	5.40	5.13	5.25
6	6.0	5.40	6.9	6.4
7	5.59	5.41	7.3	6.42
8	5.58	5.41	7.55	7.18
9	5.57	5.42	8.48	7.53
10	5.56	5.43	9.39	8.30
11	5.55	5.43	10.30	9.8
12	5.54	5.44	11.21	9.47
13	5.53	5.44	nil	10.30
			a.m.	
14	5.52	5.45	12.11	11.14
				p.m.
15	5.51	5.45	1.1	12.3
16	5.50	5.45	1.49	12.54
17	5.48	5.45	2.37	1.49
18	5.47	5.46	3.23	2.47
19	5.45	5.46	4.7	3.46
20	5.44	5.47	4.51	4.48
21	5.43	5.47	5.34	5.51
22	5.42	5.48	6.16	6.54
23	5.41	5.49	7.0	7.59
24	5.39	5.50	7.47	9.4
25	5.38	5.50	8.36	10.8
26	5.37	5.50	9.28	11.11
27	5.36	5.51	10.22	nil
				a.m.
28	5.35	5.51	11.18	12.10
			p.m.	
29	5.34	5.52	12.16	1.5
30	5.33	5.52	1·14	1.56

Phases of the Moon.

6 September, Full Moon, 3.36 a.m.
14 ,, Last Quarter, 5.31 a.m.
21 ,, New Moon, 2.38 p.m.
28 ,, First Quarter, 6.9 a.m.

ECLIPSES THIS MONTH.

THE sunburnt planet, Mercury, was beyond the sun about the middle of last month. It has now passed into the evening sky, setting, in the twilight, about 6.30 o'clock. If Mercury can be seen on 5th September it will serve as a directing post on the way to Neptune, which is far beyond, well out of sight, some 167 million miles. Mercury will be seen higher in the sky each evening all this month. Towards the end of September the planet will shine quite brightly, like a second Evening Star. On 22nd September Mercury will be passing close to Spica, the bright white star in Virgo. With the brilliant Evening Star, Venus, and the slender crescent moon nearby, a very pleasing picture will be presented. Two days later the young moon will be near the brilliant Venus. This may give rise to some old sailor-men saying, "There's a bright star doggin' the moon and there'll be bad weather." Bad weather predicting would be easy if this always held true.

PARTIAL LUNAR ECLIPSE.

In the early morning of 6th September a partial eclipse of the moon will occur. It will be full moon, of course, and the moon will be up all night. About 3.19 o'clock the edge of the moon will touch the dark shadow thrown out into space by the earth. For the next 28 minutes the moon will pass deeper into the shade, until a dark bite appears in the edge of the disc. Then the moon will gradually pass out again, until by quarter past four o'clock the bright lunar disc will be clear of the earth's tarnishing shade, allowing our wonderful old moon to again take up her ancient role of "Parish Lanthorn."

The Red Planet Mars is now very conspicuous in the evening sky. It rises soon after 8 o'clock and reaches the meridian about quarter to three. It is in the constellation of Aries, the Ram, and will be not far from the moon on 9th September. Those who have watched the movements of Mars with respect to the "fixed stars" have noted that it has been moving eastward. Its eastward bound voyage is now slowing down and by 6th September Mars will stop and begin to move back along the way it has come, until November, when it will stop again and once more head eastward.

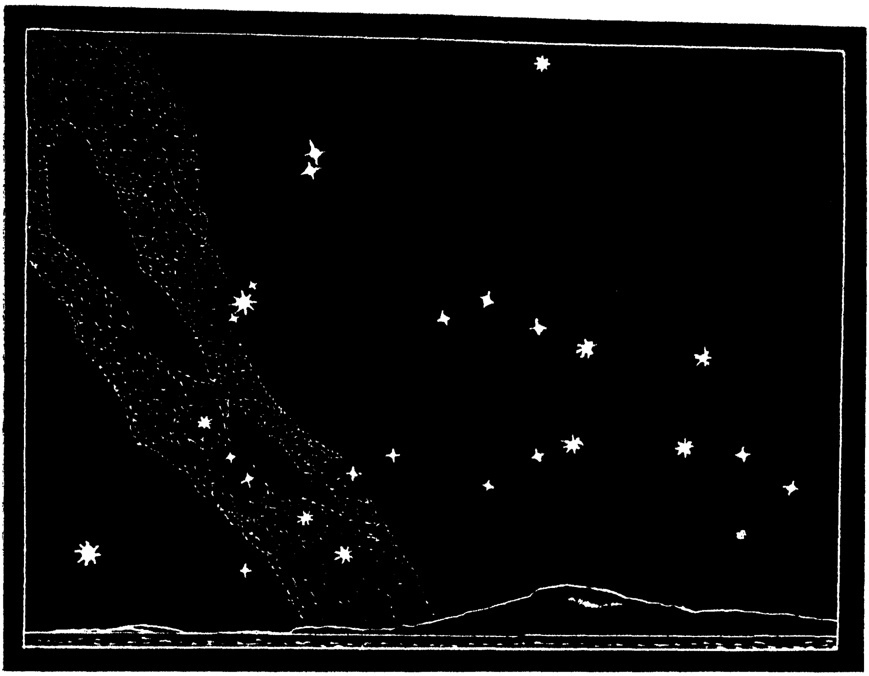
On 11th September Saturn will appear to stop and then move back for several months the way it has come. Saturn will soon be an evening star, for now it rises a half-hour after mid-night, near the Pleiades. Jupiter rises 36 minutes later, north of Orion. With these two great planets, the region of Orion, the Dog stars, the Pleiades and Hyades, is the most brilliantly starlit region of the whole heavens.

ECLIPSE OF THE SUN AT CAPE YORK.

On 21st September, along a narrow path from near the Black Sea across Asia to Formosa, on the China coast, and half way across the Pacific, a total solar eclipse will be seen by millions of people. This most amazing spectacle will only be seen for a little over three minutes, at the most. On either side of the path of totality, there will be a partial eclipse, growing progressively smaller from the central line. The limits of the partial phase will extend from the North Pole to near Townsville and from the Red Sea to mid-Pacific. Those living in Cape York north from Townsville to the southern shores of the Gulf and across Arnhem Land, may see a slight partial eclipse. Near the southern limit it will begin about 4 o'clock in the afternoon. Farther north it will begin earlier.

Spring comes to the southern hemisphere on 23rd September, when Old Sol reaches the equator on his way south to bring us the summer. During his sojourn north of the equator our nights have been longer than the days but after this date, while the sun makes his excursion south and back to the equator again, our days will be longer than the nights.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.



LOOKING NORTH IN THE LATE EVENING.

On the eastern, or right-hand side of the above patch of sky, is a very conspicuous constellation called, from very early times, Pegasus, the Winged Horse. The four bright stars which form a part of the horse's body make an almost perfect square, which is known as the Great Square of Pegasus. This great square seems to trundle across the sky, for when rising it appears on one corner. By the time it has reached the meridian (about mid-night now), it has rolled over on to its base forming a square, and when it passes to the west it becomes diamond-shaped again. Those who devised the ancient constellational figures, in the days when civilisation was young upon the earth, often left the figures unfinished. Pegasus is the forepart of a horse only, the square representing half his body. From the top left-hand star, a curve of small stars marks his curved neck and head, while from the star in the lower corner a line of stars marks the forelegs. There are some small stars which represent the wings, but they must be picked out from among the tiny stars of the Winged Horse. There is a long curved line of stars stretching from the bottom right-hand star. These are the chief stars in Andromeda. A little below, a small spot marks the position of the Great Nebula in Andromeda. This may be glimpsed on a clear night as a faint hazy spot. This object does not belong to our galaxy of stars at all, but is a separate universe, perhaps as large as our own, with its hundred thousand million suns. It is situated on the far side of a gulf of space nearly one million light years across. Those who can see this, are looking at something which occurred nearly a million years ago, for the light rays which enter the eye, left their parent suns back in that distant age.

Half way up the edge of the Milky Way is Altair, with a fainter star on either side. These are the chief stars in the Eagle. As distances go in the universe, Altair is only just across the way, it being but 16 light years—one light year is about six millions of millions of miles. These three stars point down across the Milky Way to the very brilliant star Vega, in the Lyre. Vega is the brightest star in the northern hemisphere and the third brightest star in the heavens. This brilliant sun is about twenty-six light years away but he is an old slow coach.

WE TRAVEL 43,000 MILES AN HOUR.

Our sun is moving through space—and we with him—at the rate of over 12 miles a second, but Vega only shuffles along at 10 miles a second.

If we follow the direction of Altair and his two smaller companions upward, we arrive at two third mag. stars which mark the eyes of the Sea-goat, Capricornus. One of these stars is a fine naked eye double star—two suns, situated many million miles apart, which are revolving around each other.

In the lower part of the Milky Way is a great starry cross, which is sometimes called the Northern Cross. Its proper name is Cygnus, the Swan. It is a very fine constellation and bears a striking resemblance to a flying swan winging its way up the Milky Way, its outspread wings and long outstretched neck being easily picked out. The bright, white star marking the Swan's tail is Deneb, meaning Tail. The third magnitude star at the other end, which marks the head, is Beta Cygni and in a small telescope is seen to be a beautiful double star—one golden and the other blue. The lone star at the top of the picture is Fomalhaut, the chief star in the Southern Fish, Piscis Australis. The star-groups in these illustrations are drawn rather too near the horizon, in order to get the stars mentioned within the limits of the picture. They will appear higher in the heavens, especially to people in the north.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1941 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. June.	Average Rainfall. No. of years' records.	Total Rainfall. June, 1941.	Total Rainfall. June, 1940.
North Coast.	In.		In.	In.
Atherton	1·75	40	0·34	3·72
Cairns	2·89	59	0·69	3·02
Cardwell ..	2·06	69	0·77	3·59
Cooktown ..	2·01	65	1·48	1·22
Herberton ..	1·19	55	0·22	1·75
Ingham	2·44	49	1·16	2·77
Innisfail	7·34	60	1·99	15·74
Mossman Mill ..	2·53	28	0·27	3·26
Townsville ..	1·50	24	0·17	0·49
Central Coast.				
Ayr	1·43	54	0·93	0·45
Bowen	1·61	70	1·46	0·24
Charters Towers ..	1·33	59	0·76	0·55
Mackay P.O. ..	2·71	70	7·83	0·75
Mackay Sugar Experiment Station	2·42	44	..	0·88
Proserpine ..	3·25	38	1·85	1·71
St. Lawrence ..	1·26	70	4·16	0·14
South Coast.				
Biggenden ..	2·18	42	2·57	0·19
Bundaberg ..	2·82	58	2·75	0·25
Brisbane ..	2·64	89	1·37	1·07
Caboolture ..	2·76	65	1·98	2·58
Childers	2·41	46	2·49	0·55
Crohamhurst ..	4·35	48	2·85	2·87
Esk	2·15	54	1·66	1·84
South Coast—contd.	In.		In.	In.
Gatton College ..	1·75	42	1·11	1·09
Gayndah	1·83	70	2·21	0·15
Gympie	2·61	71	2·69	1·13
Kilkivan	2·15	60	2·51	1·17
Maryborough ..	2·96	70	2·15	0·65
Nambour ..	3·70	45	3·66	8·24
Nanango	1·98	59	1·43	2·09
Rockhampton ..	2·52	70	2·76	Nil
Woodford ..	2·80	54	2·08	1·87
Central Highlands.				
Clermont ..	1·65	70	3·15	0·07
Gindie	1·40	42	..	Nil
Springsure ..	1·73	72	3·84	0·05
Darling Downs.				
Dalby	1·66	71	1·04	0·94
Emu Vale ..	1·46	45	1·70	0·41
Hermitage ..	1·59	35	..	Nil
Jimbour	1·55	62	1·30	1·24
Miles	1·71	56	1·42	Nil
Stanthorpe ..	1·87	68	3·07	1·03
Toowoomba ..	2·35	69	1·81	2·11
Warwick ..	1·71	76	1·64	0·64
Maranoa.				
Bungeworgoral ..	1·15	27	..	Nil
Roma	1·51	67	0·90	0·13

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 1941.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means. Max.	Shade Temperature. Means. Min.	Shade Temperature. Extremes. Max.	Shade Temperature. Extremes. Date.	Shade Temperature. Extremes. Min.	Shade Temperature. Extremes. Date.	Rainfall. Total.	Rainfall. Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	..	78	67	87	9	58	29	148	5
Herberton	..	70	49	76	8	38	23	22	5
Rockhampton	30·11	72	53	78	1. 19	42	27	276	6
Brisbane	30·12	69	52	76	19	43	28	137	8
Darling Downs.									
Dalby	..	66	43	73	5	30	28	104	8
Stanthorpe	..	68	38	64	7, 18	38	24·3, 26	307	9
Toowoomba	..	60	45	67	7	36	11	181	10
Mid-Interior.									
Georgetown	30·06	81	52	86	8, 12	37	24	63	2
Longreach	30·14	74	46	82	19	37	11, 22, 23	352	5
Mitchell	30·17	65	41	74	6	29	28	157	
Western.									
Burketown	..	79	54	85	1, 6, 7	47	23	103	2
Boulia	30	73	46	82	30	40	10, 11, 21, 23	154	4
Thargomindah ..	30.15	64	45	77	7	35	11	58	2

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.

Vol. LVI. 1 SEPTEMBER, 1941 Part 3

Event and Comment

Vigilance for Victory.

IN the Old Country a Vigilance for Victory Group is busy linking up war efforts with post-war plans. Collaborating with the Vigilance for Victory Group is a Political and Economic Planning Group, and in keeping with its initial letters P.E.P., it is putting plenty of "pep" into the national cause.

Informed, searching, and constructive criticism is a characteristic of these live-wire units in Britain's planning campaign, and they accept no excuse for slackness in their particular fields. They are, in effect, a sort of observer corps to the fighter command, watching each situation as it develops in their own special sphere, and losing no time in mobilising expert opinion and determination to consider and recommend effective courses of action to the authorities.

From our own experience in the present war, and also from our own experience since the last war, we shall obviously have to prepare for and, if practicable, evolve or establish a new technique in our national economy. What has to be done is to see that "the framework of scientific co-operation and organisation is adequate both to the demands of war-time and to the reconstruction to follow."

In the foregoing is a suggestion of a double-barrelled slogan: Vigilance for Victory; Political and Economic Planning for Peace.

The Unwise Use of Land.

LACK of wisdom in the use of land has been largely the cause of serious loss of soil in many districts. Here is a picture of a stretch of country which was once regarded as rich grazing land; in fact, it was once considered to be amongst the best of our pastoral territories:—"Great stretches are absolutely bare, overstocking has resulted in the disappearance of the permanent grasses, and with little to hold the top soil together it has gradually washed away. The erosion has been going on for a number of years, and, perhaps, has been imperceptible, but the facts are there for anyone with knowledge of the land to see."

There it is—some parts of the country with richly soiled slopes have been eroded to ribbons and on which, even after good soaking rain, the feed can only be classed as goose picking.

Even after successive good growing rains, the grass on this country has failed to respond, and to-day many paddocks look as though they are showing the effects of a very severe drought. notwithstanding heavy and continuous rains in summer and autumn. In contrast to this scene of desolation, in the same district there are properties on which perennial grasses have been given a chance by being wisely stocked, and which are now carrying an abundance of feed.

This is how a well-known and successful grazier has put it: "One of the greatest evils in Australia is the overstocking of our grazing lands. On sheep-to-the-acre country the sound policy is to run only one sheep to an acre and a-quarter, the quarter being a reserve against drought. This is cheap insurance that pays a wonderful dividend."

Standardization of Farm Equipment.

THE visitor to many farms is impressed by the aggregation of farm implements and machinery—all necessary for efficient working—on every holding. The practicability of standardizing all this farm equipment seems to be well worth inquiring into. It is not supposed that many farmers have given more than a passing thought to the work of the Standards Association of Australia, yet standardization, especially as applied to agricultural equipment, offers a real economy. Up to the present, the Standards Association has made rather slow progress in its attempt to establish some measure of standardization in respect of the wearing parts of farm machinery, but that, it has been asserted, is not the fault of the association. Standards for farm building, fencing, and other materials have been fixed for some years, but although these measures of standardization directly benefit the farmer, they are not, apparently, widely known. On the Agricultural Machinery Committee of the Australian Standards Association are representatives of primary producers, as well as of machinery manufacturers, and this committee has been trying for years to standardize various plough parts; although draft or final standards have been issued for cultivator points, knife sections of Australian mowers and binders and sprocket chains. Threads

of grease cups and nipples and nuts and bolts for general use in agricultural machinery are items now awaiting the work of other committees.

Two other things of importance to the farmer are plough discs and pneumatic tyres. The extraordinary number of discs in use raises the question as to why so many sizes are regarded as necessary. However, an attempt is being made to do away with a number of inconvenient sizes, and to simplify the method of attachment.

It has been observed that pneumatic tyres for implements are becoming more popular. There is no doubt that they reduce the draft of the implements to which they are fitted, and are better than steel wheels for most purposes; but they will not be used as widely as they might be if a farmer has to have a separate set of tyres for each outfit, which he may use only for a few days or a few weeks in the year. The difficulty could be got over easily by specifying a standard set of, say, discs and tyres that could be attached easily to the various implements as they are required. All implements could not, of course, be so fitted, but still the number that could be so fitted is surprising, and there would be much more economy in the use of pneumatic tyres if one set of wheels could thus be made to serve a whole farm.

When the need for standardizing a certain article crops up, it is suggested that the Standards Association should be asked to consider it. A community request for standardization along certain lines from a local farm group or, say, the Council of Agriculture, would be better still. That would be one way of establishing a valuable form of co-operation between the primary producer and machinery manufacturer, and standardization of common machinery parts would benefit everyone concerned. Standardization would also prevent waste—and waste is an enemy in peace or war.

The Rural Scene in Britain.

THE farmers of Britain have changed the face of their country and changed it in less than a couple of years. Green swards of grassland unbroken by the plough for many a long year have disappeared and deep, brown furrows in endless rows are now the most impressive landscape features. This is the best of evidence that rural Britain is wide awake and playing once more its full part in the life of the community. Increasingly, grassland is going under the plough. The land is growing more food and farmers are putting their full weight into winning the war. Sound farming practice is the rule on every acre within the farm fences and the foundation of a new era of rural prosperity, based on healthy soil, when peace returns is being well and truly laid. And this new era will bring, it is believed, a sounder rural economy which will check the drift to the cities; so, whatever else may happen, "the nation will be richer in happiness and good life by having put to nobler use the land—the first asset of mankind."

Sheep Blowfly Control.

SCHOOLS OF INSTRUCTION.

FOR a number of years research into the sheep blowfly problem has been actively prosecuted. Notwithstanding the fact that the results of this work have been reported in scientific and popular publications, the losses caused by blowfly attack are still serious indeed.

On reviewing the position, the Joint Blowfly Committee, representative of the Council for Scientific and Industrial Research and the New South Wales Department of Agriculture, felt that the methods of dealing with blowfly were not sufficiently known and their value not sufficiently appreciated.

Arrangements were therefore made to conduct special schools of instruction at the Animal Husbandry Farm near Sydney, and these were attended by scientific officers from all States, including four from the Queensland Department of Agriculture and Stock.

In order to disseminate as widely as possible the knowledge gained by these officers, a further school was held at the Animal Health Station, Yeerongpilly, from 5th to 8th August, 1941.

Opening of Yeerongpilly School.

In officially opening the Yeerongpilly School, the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) said that on such an occasion he realised the necessity for co-operation as between the various component parts that work together to find a solution to a problem. Here was an example of that co-operation in its most practical application; the Council for Scientific and Industrial Research, the State and the University on the one hand, and on the other those whom it was sought to serve—the graziers.

Probably one of the greatest difficulties with which scientific bodies were confronted was not so much the magnitude of the problem in the laboratory, but the task of getting that knowledge out to the layman. He had long pondered on the possibility of setting up some form of organisation to translate the achievements of the laboratory to the practical man and make them applicable to industry. There was a tremendous volume of knowledge on the problem of blowfly control that had never been applied.

He believed the average grazier was keen to learn and frequently asked, "Where can I get the information I need?" There was another school of thought which adopted the attitude that when the fly came along it was "just too bad," and soon the fly would go away and everything would be well. That type of individual was a menace to the industry.

Preventable economic loss in industry, continued the Minister, was one of the big problems which we as Australians have to tackle. We were fortunate when we compared our position with that existing in other countries, but it was true that because we enjoyed some measure of immunity from the more serious, dangerous, and mortal diseases of stock, we were apt to under-estimate the seriousness of the things in our midst.

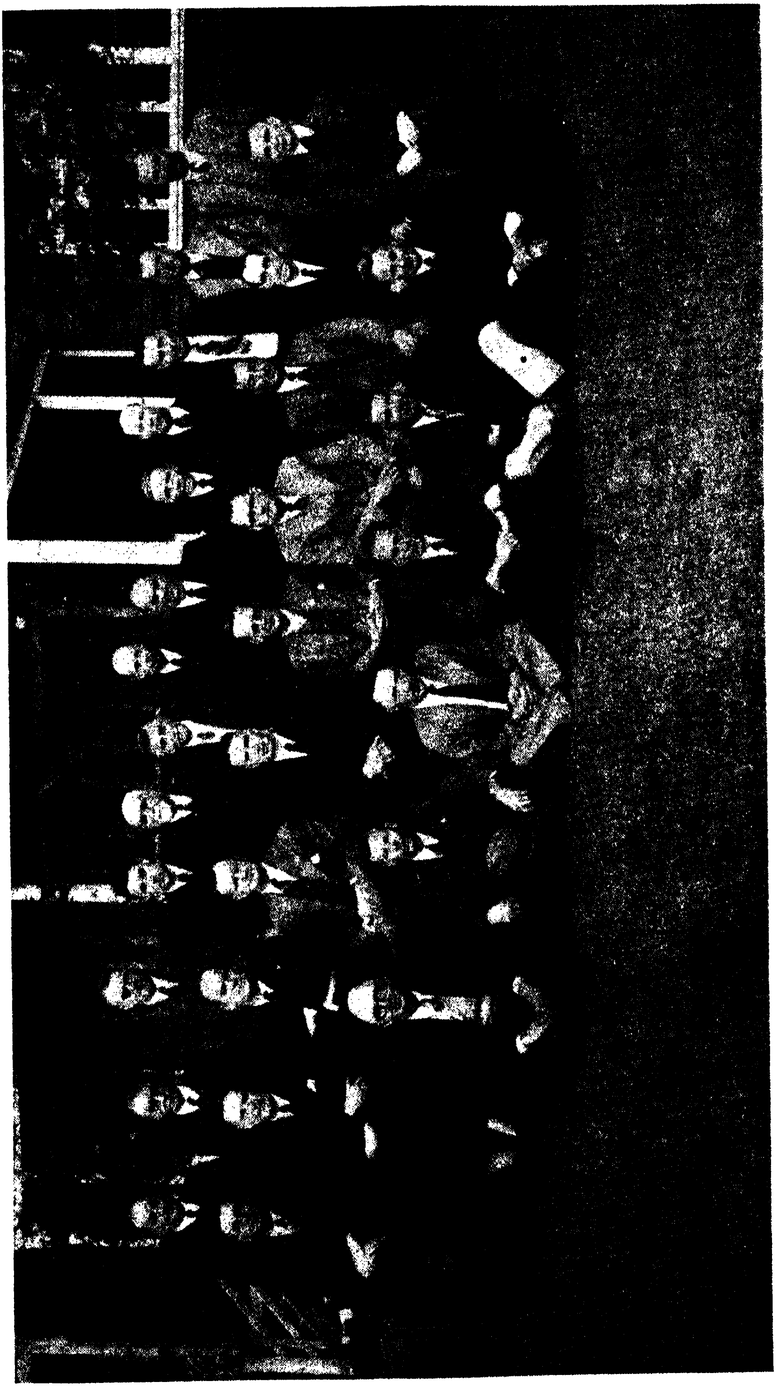


Plate 37.
AT THE OFFICIAL OPENING OF THE BLOWFLY SCHOOL.

It was planned, by continuous rippling such as occurs when a stone is thrown into a pond, to set up a nucleus of information at this school and to expand that to other schools to be held in the worst fly-infested areas of the State.

There had been a tendency for the laboratory man to divorce himself from the public. Perhaps that did not apply in Queensland to the same extent as in other places. The School of Veterinary Science of the Queensland University was established—and deliberately established—in conjunction with the animal health services of the State to ensure the widest distribution of knowledge and to prevent the animal health services from becoming self-centred and self-sufficient and the University from sitting in its own corner without working in conjunction with the Department.

Plate 38.
DEMONSTRATING BREACH CONFORMATION WHICH PREDISPOSES TO FLY STRIKE.

The Council for Scientific and Industrial Research, which had carried out a great deal of research work on the blowfly problem, was anxious to make available the knowledge resulting from this work. It was interesting to record that the recommendation from the Standing Committee to the Australian Agricultural Council, that each State send delegates to a central blowfly school, was carried without debate. It was adopted unanimously by every Minister for Agriculture in Australia. The whole scheme was being financed to some extent by the Australian Wool Board, which had provided a sum of £600. The State would have to supplement that amount materially to carry out the project to a successful termination.

At one time, said Mr. Bulcock, he had asked a friend of his associated with the University of Queensland to give him in round figures the monetary value of preventable economic loss in Queensland, and he was amazed when a figure of some £10,000,000 was returned. It meant that Queensland industries were contributing £10,000,000 for which they received no dividend, and it became an overhead charge against those industries.

He had no doubt that Queensland's maximum economic loss was found as a result of tick infestation and blowfly damage. The losses caused by blowfly could be reduced considerably, not by difficult methods and costly methods, not by methods requiring laboratory determination for their application, but, so far as he could understand, by common-sense methods which the average man with ordinary intelligence could apply. Because that was so he welcomed this school. He believed it would be the forerunner of many of a similar character.

Plate 39.
THIS DEMONSTRATION AT THE BLOWFLY SCHOOL ATTRACTED KEEN INTEREST.

There were many other problems confronting our primary industries, and if this proved to be the right way of carrying knowledge from the research organisation to the man earning his livelihood by participation in industry, then it would prove of great assistance to primary producers.

Every Departmental officer stationed in areas where the blowfly pest presented itself should have up-to-date knowledge in respect of the preventive and curative stages of treatment. If, having trained these officers, the Department succeeded in passing the information on to the graziers and selectors, it would be an encouragement to carry on.

If, however, there was no hearty co-operation by the graziers and selectors, it would be most difficult to proceed further. At this time of financial stringency expenditure could not be incurred needlessly and finances dissipated.

The first duty of those attending the school, continued the Minister, was to apply the knowledge gained in their own practices. Their second duty was to see that that knowledge was as widely distributed as possible. The theory that Governments should be held entirely responsible for all forms of technical education must break down under the urge of present times.

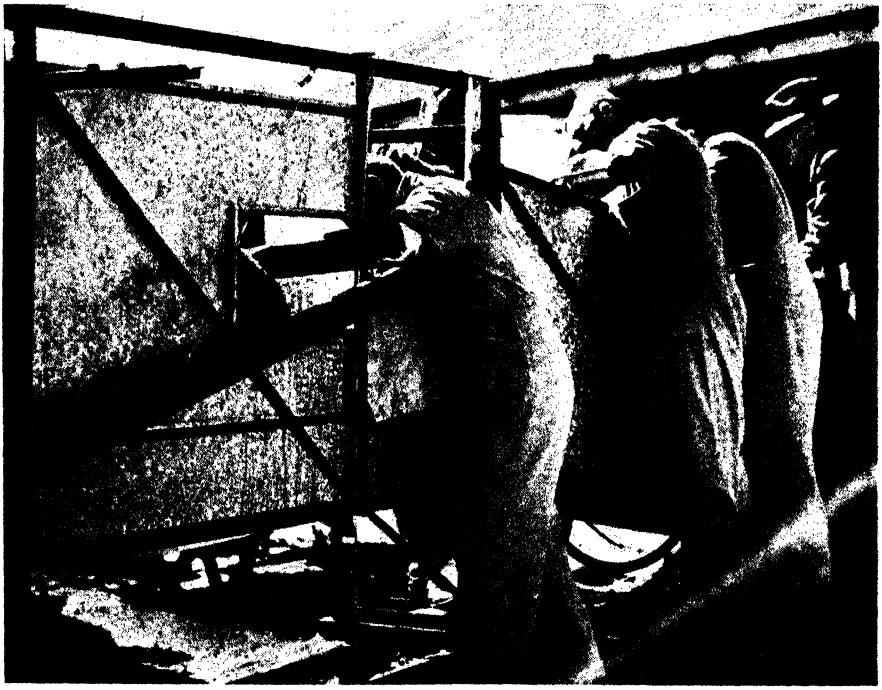
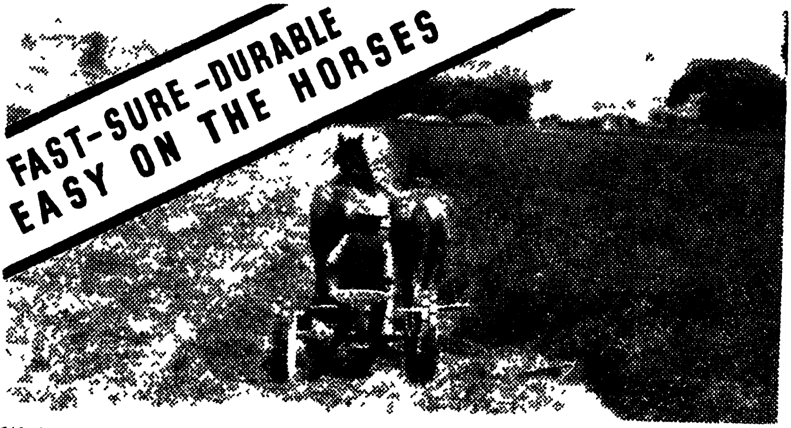


Plate 40.
JETTING SHEEP IN ELEVATED JETTY RACE OF THE TANONGA TYPE.

In conclusion, Mr. Bulcock extended congratulations to those who made the school possible. Although the Council for Scientific and Industrial Research had been criticised from time to time, it was frequently because its critics had only a limited knowledge of its wide ramifications. He thought that the Council for Scientific and Industrial Research, by its action in making the school possible, had contributed materially to the wellbeing of the nation.

Instructional Programme.

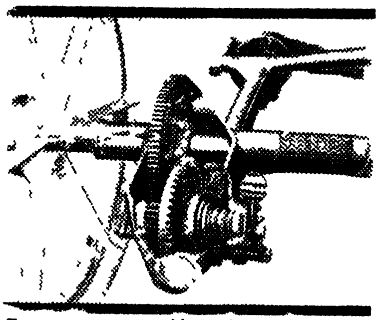
The course of instruction at the Yeerongpilly School was a very comprehensive one, and included both the theoretical and practical aspects of blowfly control. After discussing the relative importance of the various species of blowflies concerned in strike and the possibilities of their control by trapping, poisoning, and biological methods, attention



With its steel, machine-cut gears located for balance behind the axle, the New McCormick-Deering GL-No. 9 mower brings more speed and efficiency to hay cutting . . . Easier on the horses as well as on the driver . . . All gears automatically lubricated in enclosed bath of oil . . . Ball-bearing transmission with Zerol bevel gears . . . One-piece, roller-bearing axle . . . Latchless levers . . . ball-bearing automatic pitman . . . Heat-treated cutter bar . . . First and only steel-gear mower made in Australia.

THE NEW McCORMICK-DEERING

GL-No. 9 STEEL-GEAR ★ MOWER



Transmission assembly with gear case cover removed. Entire transmission runs in enclosed bath of oil.

The gear case is located behind the axle, thus tending to balance the weight. The "two-step" arrangement of the gears is also a factor in preventing neckweight on the horses, because there is no downthrust on the end of the pole in heavy cutting.

This is the sweetest-running mower on the market Ask your nearest International Harvester agent for full particulars or write for catalogue.

INTERNATIONAL HARVESTER COMPANY OF AUSTRALIA PTY. LTD.
(Incorporated in Victoria)

278-294 Roma Street, Brisbane, B.13

4453

was given to the various factors which are now known to predispose sheep to blowfly attack. Measures to reduce immediate susceptibility, such as jetting, crutching, and the Mules operation, received special attention.

Each officer was given the detailed theory of the various control measures, and also had an opportunity of becoming familiar with the pactical side through personal practice. Jetting plants supplied by courtesy of various Brisbane pastoral firms were displayed and their operation explained. Demonstrations were also given of the significance of wrinkly breech, faulty withers, and bad types of wool in the predisposition of the sheep towards blowfly attack.

Dr. L. B. Bull and Dr. A. J. Nicholson, Chiefs respectively of the Divisions of Animal Health and Economic Entomology of the Council for Scientific and Industrial Research, whose visit coincided with the period of the school, addressed the school and were able to impart valuable information secured through the researches of their respective divisions.

Country Schools.

A school for Departmental officers is to be held at Blackall, and arrangements have been made, in co-operation with the United Graziers' Association and the Selectors' Association, to hold four two-day demonstration schools for sheepowners and others who are concerned in dealing with sheep blowfly. These are set down as under:—

Blackall	11th and 12th September.
Longreach	16th and 17th September.
Winton	23rd and 24th September.
Julia Creek	29th and 30th September.

To all attending these demonstration schools suitable printed material is being issued, so that they may have details for later reference.

THE NASAL FLY—A SERIOUS PEST OF SHEEP.

During the spring and summer months, graziers in many parts of the State may be puzzled for an explanation as to why their sheep, for no apparent reason, suddenly gallop round the paddock, or stand in bunches with their faces buried in each other's wool, or held very closely to the ground. If such a group is watched closely, the attitude of the animals will be seen to be due to the presence of a stout, greyish fly, which frequently is to be seen during spring time and early summer resting on the fly screens and water tanks around the homestead. This is the sheep nasal fly, which lays its maggots on the edges of the nostrils of the sheep. The action of the aninmals in burying their noses in the wool of other sheep, or in the soil, in an endeavour to protect them from the flies, is readily understandable.

The maggots, after they have been laid by the female fly, crawl up the sheep's nostrils and into the communicating cavities. Here they remain for several months. Being provided with a pair of stout hooks in the region of the mouth, they attach themselves to the lining of the nostrils and cause the secretion of much pus-charged mucous, on which they feed. The condition in sheep known as "snotty nose" is due to the presence of these maggots, which may also be responsible for such a severe irritation that the infested animal loses condition.

Control of the sheep nasal fly is not very effective at present, but much good can be done by daubing the animals' noses at frequent intervals with Stockholm tar. This procedure should be especially carried out between October and January, inclusive, when the flies are most numerous.

Green Manuring—Stanthorpe Investigations, 1937-40.

KEIGHLEY M. WARD, M.Agr.Sc., Research Officer.

IT is generally recognised that the addition of organic matter improves most soils because of the effect produced on their chemical, biological, and physical properties. The practice of ploughing-in green manures has consequently come to be looked upon as of fundamental importance in many branches of horticulture and agriculture. Considered broadly, the principal effect of the addition of organic matter to the soil is to increase the availability of nutrient elements which are naturally present in the soil, or which have been added as artificial fertilizers.

In general, the soils of the Stanthorpe district are low in organic matter in the virgin state, and continuous cultivation leads to the rapid depletion of their humus content. The building up and maintenance of a supply of soil organic matter thus forms one of the most important of a group of operations that are fundamental to the proper nutrition of crop plants in this district. There are many difficulties, however, brought about mainly by climatic and soil factors, which limit the growth of green manures at Stanthorpe, and in consequence satisfactory crops of green manure are not common, the yield of green matter generally ranging from 1 to 4 tons per acre. This is inadequate, and the position definitely calls for improvement. Such an improvement can be expected only when important climatic and soil factors are given due consideration.

The climate of the district is characterised by an annual rainfall of 30 inches, 40 per cent. of which falls in the autumn and winter months, the latter season usually being the driest period of the year. Rainfall is rather uncertain in all seasons, and periods of little or no effective rain occur fairly frequently. This and a high rate of evaporation sometimes cause sufficient drying out of the soil to restrict the growth of crops, and the need for the employment of moisture conservation practices in all branches of local farming requires little stressing. Winter frosts, which are numerous and severe, are another climatic feature of the district; over a period of thirty-four years the mean minimum air temperatures for June, July, and August have been 36·6 deg., 33·2 deg., and 35 deg. F., respectively, whilst during this period minimum grass temperatures have occasionally reached 6 deg. F.

The soils of the district consist of decomposed granite, and are generally of a coarse-grained, sandy texture. After rain, they almost invariably form a rather hard surface crust, which is partly attributable to lack of organic matter. The level of fertility of these soils is such that successful crop production, including the growing of green manure crops, depends largely on the judicious use of fertilizers, for plants growing in them frequently exhibit deficiencies in major and trace elements, lack of nitrogen being particularly evident.

From the foregoing it is apparent that successful cultivation of green manures in the Stanthorpe district depends very largely on supplying nutrient elements in which the soil may be deficient and planting varieties that are drought and frost resistant. Since 1937, various aspects of the green manuring problem have received attention,

and this article deals with that part of the work concerned with determining the nitrogen, phosphoric acid, and potash requirements of green manure plants, and with the testing of potentially suitable varieties. On account of the necessity for conserving moisture during the main growing season, attention has been focussed chiefly on winter green manure crops.

FERTILIZER EXPERIMENTS.

During the past four years a series of fertilizer experiments has been conducted on cereal and leguminous crops. The experiments were laid down in apple orchards which differed with respect to the age and condition of the trees, soil types, and location in the district, and were set out in designs which allowed statistical examination of all quantitative data. The size of the plot adopted throughout the work was 60 feet by 15 feet, and the yield of green matter was measured by cutting and weighing ten 1-square-yard random samples in each plot. Prior to sowing, the land was ploughed and harrowed, the fertilizers usually being turned under in the ploughing process; the seed was then broadcast and harrowed in. Sometimes the fertilizers and seed were broadcast at the same time and then covered. In ensuing months, observations were made on the rate of growth and general condition of the crops, and the samples were taken immediately before the plants reached the flowering stage.

1937 Experiments.

In 1937, two experiments were conducted at The Summit in a nineteen-year-old orchard in which the trees, although not very vigorous, had previously made good growth and were still bearing satisfactory crops. The soil had received moderate applications of mixed fertilizers in previous years. The plants employed were Florence wheat and New Zealand blue lupins. The value of the 4·76 inches of rain that fell during the four-month growing period of the plants was considerably reduced by its unsatisfactory distribution.

TABLE 1.

SHOWING THE INFLUENCE OF FERTILIZERS ON THE YIELD OF GREEN MATTER OF FLORENCE WHEAT AND NEW ZEALAND BLUE LUPINS. THE SUMMIT, 1937.

Treatment.	Rate of Application in Cwt. per Acre.	Yield of Green Matter in Tons per Acre.	
		Wheat.	Lupins.
1. N—Sulphate of ammonia	2	3·33	2·44
2. P—Superphosphate	2	1·25	1·13
3. K—Sulphate of potash	2	1·47	1·31
4. NP—Sulphate of ammonia and superphosphate	2, 2	4·14	2·65
5. NK—Sulphate of ammonia and sulphate of potash	2, 2	3·76	2·14
6. NPK—Sulphate of ammonia, superphosphate, and sulphate of potash	2, 2, 2	4·19	2·65
7. KMg—Sulphate of potash and magnesium sulphate	2, 1	1·15	1·21
8. No fertilizer	..	1·17	1·20
Standard errors	..	0·236	0·199
Significant differences	..	0·68	0·58

The results of the experiments (Table 1) show that, in so far as wheat is concerned, all treatments in which nitrogen was included gave

considerably greater yields than those from which nitrogen was omitted (Plate 41). These latter treatments, Nos. 2, 3, and 7, produced no increased growth response whatever when compared with untreated plots. Another feature of the results was that plots receiving superphosphate with sulphate of ammonia (*i.e.*, treatments 4 and 6) showed a definite increase in yield when compared with those receiving sulphate of ammonia only. It was evident, too, that the addition of potash to the mixture of sulphate of ammonia and superphosphate did not lead to a further increase in yield. In general, plots which received nitrogen produced three times as much green matter as those to which nitrogen was not added.

Plate 41.

PLOT OF FLORENCE WHEAT.—Plot of Florence wheat in foreground received 2 cwt. superphosphate per acre and yielded 1.3 tons per acre. Plot in background received 2 cwt. sulphate of ammonia per acre and yielded 3.5 tons per acre. Marked response on latter plot occurred despite dry weather.

Somewhat similar results were obtained when the same treatments were applied to lupins. Here again, all plots in which nitrogen was present yielded considerably more than those from which it was absent, and the latter actually produced no more green matter than unfertilized plots. In the case of lupins, however, sulphate of ammonia was as effective alone as when combined with any of the other fertilizers. Neither superphosphate nor sulphate of potash, used either alone or in combination, brought about any increase in yield. Lupin plots receiving nitrogen produced double the amount of those not receiving this element.

It is noteworthy that, despite the occurrence of unfavourably dry weather conditions, the influence of the effective fertilizers was felt in a marked degree as can be seen from Plate 41.

1938 Experiments.

The site of the 1938 experiments was a non-bearing, three-year-old apple orchard in which vegetables had been grown for some years, during which time the soil had received applications of sheep manure and sulphate of potash. In these experiments the plants used were Black Winter rye and New Zealand blue lupins, which are later usually referred to simply as rye and lupins respectively. During a growing period of five months the plots received a well-distributed rainfall of 8·14 inches.

TABLE 2.

SHOWING THE INFLUENCE OF FERTILIZERS ON THE YIELD OF GREEN MATTER OF RYE AND NEW ZEALAND BLUE LUPINS. THE SUMMIT, 1938.

Treatment.	Rate of Application in Cwt. per Acre.	Yield of Green Matter in Tons per Acre.	
		Rye.	Lupins.
1. N_1—Sulphate of ammonia	1	8·95	2·75
2. N_2—Sulphate of ammonia	2	9·97	3·35
3. NP—Sulphate of ammonia and superphosphate	2, 2	8·68	5·08
4. NK—Sulphate of ammonia and sulphate of potash	2, 2	9·24	2·79
5. PK—Superphosphate and sulphate of potash	2, 2	6·01	2·11
6. NPK—Sulphate of ammonia, superphosphate, and sulphate of potash	2, 2, 1	9·60	3·50
7. Ca—Lime	3	5·95	1·72
8. NCa—Sulphate of ammonia and lime	2, 3	8·76	4·02
9. No fertilizer	..	5·29	3·30
Standard errors	..	0·777	0·524
Significant differences	..	2·27	1·53

The treatments given and the results obtained in this experiment are presented in Table 2. This table shows that in the rye plots the three treatments from which nitrogen was excluded, *i.e.*, Nos. 5, 7, and 9, gave similar yields, all of which were significantly lower than those given by the other six treatments in which nitrogen was included. There were no significant differences between any of these six latter treatments. The application of 1 cwt. of sulphate of ammonia per acre in treatment 1 in this orchard was practically as effective as the 2 cwt. in treatment 2, and sulphate of ammonia gave as great a response when used alone as when combined with other fertilizers. The results obtained were undoubtedly influenced by residues from fertilizers used previously in the orchard. Plots receiving nitrogen made excellent growth, the plants commonly attaining a height of 5 feet (Plate 42). Lupins yielding a comparable amount of green matter in a varietal experiment in the same year were only 15 to 18 inches in height (Table 3 and Plate 52). This height factor is important in connection with the effective ploughing-in of the crop.

With respect to the lupins, the results were somewhat affected by factors other than the fertilizers, and in particular poor drainage in some plots was no doubt responsible for the high variation in the yields obtained. Under the conditions prevailing, sulphate of ammonia, together with superphosphate, in treatment 3 produced a marked increase in the yield of lupins. This treatment was significantly superior to all

others excepting the nitrogen-lime combination in treatment 8, but since the latter treatment did not give a significantly higher yield than the unfertilized plots, no great importance can be attached to it. The yield of lupins in limed plots was actually less than in unfertilized plots.

Plate 42.
WELL-GROWN CROP OF RYE FOR GREEN MANURE.—This plot received 2 cwt. sulphate of ammonia per acre and yielded 10 tons per acre.

1939 Experiments.

Prior to the 1939 experiments, the fertilizers had been applied in approximately balanced proportions—*i.e.*, equivalent amounts of nitrogen, phosphorus, and potash had been given. It was now considered desirable to discover the effects of the fertilizers when combined in varying proportions. Accordingly, in 1939, experiments were designed to study the effects on green manure crops of a nitrogenous fertilizer, superphosphate, and sulphate of potash when applied at three different levels or rates of application, and in all possible combinations with each other. Four factorial experiments were laid down in the autumn of 1939, one on rye and one on Dun field peas, in each of two widely separated parts of the district, viz., Cottonvale and Glen Aplin. The soil types of these areas differ somewhat; that at Cottonvale showing evidence of having passed through an alluvial phase, though it is of granitic origin, whilst that at Glen Aplin is a typical residual granitic soil. The experimental blocks were laid down in nineteen-year-old apple orchards, both of which were showing marked effects of depleted soil fertility. The treatments applied and the rates of application at Cottonvale were as follows:—

Fertilizer.		Level.		
		0	1	2
N = Nitrate of soda	Cwt. per acre	0	1½	2½
P = Superphosphate	Cwt. per acre	0	1	2
K = Sulphate of potash	Cwt. per acre	0	½	1

At Glen Aplin, the treatments given were the same except that sulphate of ammonia replaced nitrate of soda as the source of nitrogen, and was used at the rate of 0, 1, and 2 cwt. per acre. During the four-month growing period a well distributed rainfall amounted to 6.56 inches.

Responses on Rye Plots.

An analysis of the samples showed that highly significant results were obtained in both experiments on rye. The main results from the Cottonvale plots are expressed in Plate 43, which shows the interactions of the three fertilizer materials at the various levels of application.

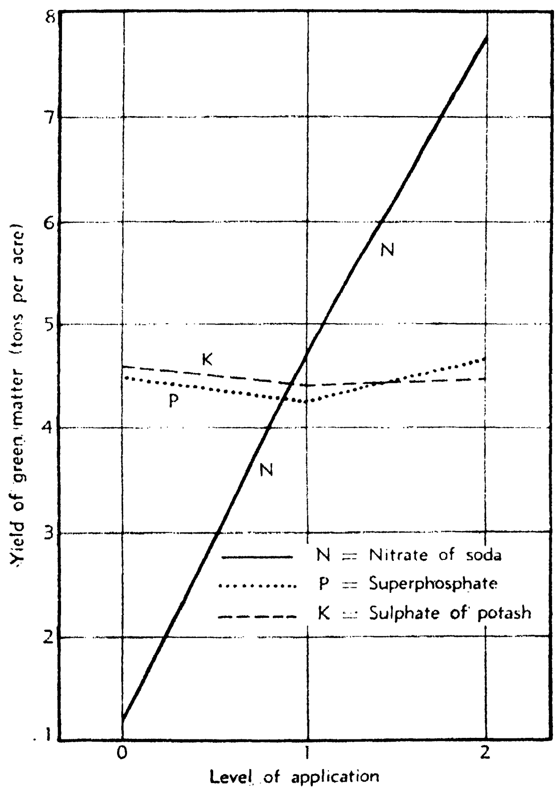


Plate 43.

FERTILIZER EXPERIMENT AT COTTONVALE, 1939.—Showing interactions between nitrate of soda (N), superphosphate (P), and sulphate of potash (K) on rye plots.

There was a most striking response to the 1¼ cwt. and 2½ cwt. levels of nitrate of soda, as is shown by the steep upward slope of the curve for N which rises from 1·16 tons of green matter per acre at the 0 level to 4·62 tons at the 1¼ cwt. level, and to 7·61 tons at the 2½ cwt. level (Plate 44). The degree of response to this fertilizer is almost directly proportional to the amount applied, the yield given at N_1 being approximately half way between those given by N_0 and N_2. This result suggests that the yield might have been still further increased by heavier applications of nitrate of soda, and points to a serious nitrogen deficiency in the orchard soil involved. The ability of rye to establish itself and to grow through the winter months was most marked, particularly in plots that had

Plate 44.

PLOT OF RYE.—Plot on left received 2½ cwt. nitrate of soda and yielded 7.7 tons green matter per acre; plot in foreground received 1 cwt. sulphate of potash and yielded 1.5 tons per acre.

received nitrogen; indeed, differences between plots receiving nitrogen and those from which nitrogen was omitted were very striking almost from the time the plants first appeared aboveground.

Plate 45.

ANOTHER PLOT OF RYE.—This rye plot received 1 cwt. each of superphosphate and sulphate of potash per acre; it yielded 1.4 tons per acre.

Superphosphate and sulphate of potash, applied singly or in combination, produced no significant growth response at any level of application, as is indicated in Plate 43 by the flatness of the P and K curves. Plots receiving these two fertilizers yielded about 1 ton of green matter per acre (Plate 45); this was comparable with the yield obtained in unfertilized plots. The relative effectiveness of the different fertilizers is emphasised in Plate 46.

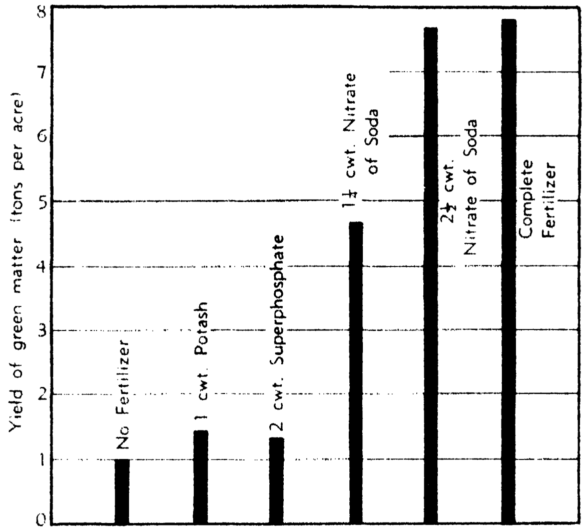


Plate 46.

FERTILIZER EXPERIMENT AT COTTONVALE, 1939.—Showing marked responses to applications of nitrate of soda on rye plots in a low-vigour, nineteen-year-old apple orchard at Cottonvale.

In the second experiment on rye, that at Glen Aplin, where the same treatments were applied, the results obtained were generally similar to those of the Cottonvale experiment. Here, again, the nitrogenous fertilizer, this time sulphate of ammonia, produced large and highly significant responses (Plate 47).

The first application of sulphate of ammonia, i.e., 1 cwt. per acre, increased the yield of green matter from 1·71 tons per acre to 4·24 tons, and the second application of 2 cwt. per acre increased it further to 5.85 tons. The increase from the second application was, however, significantly less than the increase from the first, and this would appear to indicate that 2 cwt. per acre is approaching the maximum desirable quantity. Superphosphate gave no significant response whatever, whilst sulphate of potash gave a significant though small increase with an application of 1 cwt. per acre. In this experiment potash tended to lead to increased yields at the highest level of sulphate of ammonia (Plate 47).

Responses on Pea Plots.

At Cottonvale, significant increases in yield followed the use of all fertilizers at one or other of the levels employed. The 1¼ cwt. per acre level of nitrate of soda gave a well-marked response by increasing the quantity of green matter from 1·96 to 3·06 tons per acre as shown in

Plate 48. The highest level of 2½ cwt. per acre did not cause a significant increase in yield over that obtained at the lower level, although there was still an upward trend. Plots receiving potash at the rate of ½ cwt. per acre yielded significantly more than either the no-potash plots or those receiving 1 cwt. per acre. In other words, ½ cwt. of potash gave an increase in yield, but 1 cwt. of this fertilizer tended to depress it. With respect to superphosphate, at the level of 1 cwt. no increase in yield occurred; but the higher application of 2 cwt. per acre caused a well-marked rise from 2·15 to 3·93 tons of green matter per acre. These responses of P and K were noticeable in both the presence and the absence of nitrogen.

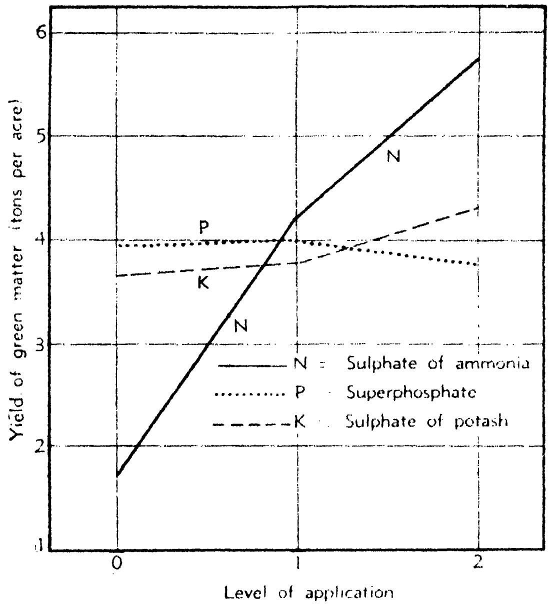


Plate 47.

FERTILIZER EXPERIMENT AT GLEN APLIN, 1939.—Showing interactions between sulphate of ammonia (N), superphosphate (P), and sulphate of potash (K) on rye plots.

A study of the interaction of nitrate of soda and superphosphate in these plots showed that the heaviest application of superphosphate was more beneficial when applied in conjunction with the highest level of nitrate of soda. In the interaction of sulphate of potash with superphosphate the depression of growth resulting from the higher level of potash was more marked at the higher level of superphosphate.

The results obtained at Glen Aplin (Plate 49) differed in some respects from those at Cottonvale. In the Glen Aplin plots sulphate of ammonia caused significant responses at both rates of application. This fertilizer applied at the rate of 1 cwt. per acre increased the yield from 0·76 tons to 1·35 tons, whilst 2 cwt. increased it to 2·35 tons. An application of 1 cwt. of superphosphate led to a small increase in yield from 1·21 to 1·76 tons per acre, but 2 cwt. did not give any further increase. Potash gave no significant responses in the experiment. The relatively low yield of green matter in even the best of the pea plots is noteworthy, indicating as it does the difficulty experienced with field peas in producing that bulkiness of crop which is so desirable.

1940 Experiment.

In the 1940 experiment, which was laid down in April, all possible combinations of nitrate of soda, superphosphate, and sulphate of potash at three levels were applied in a factorial layout in which lupin plants were sown. Unfortunately, the experiment was marred by an

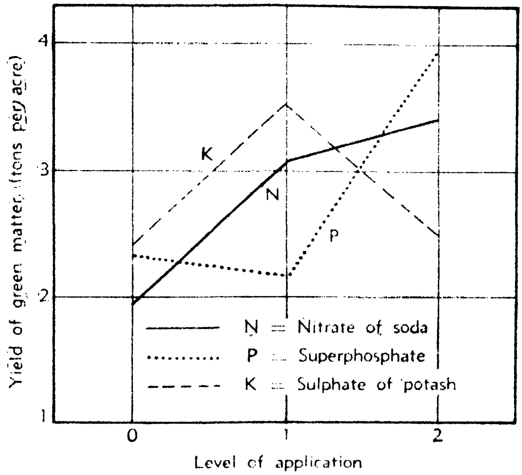


Plate 48.

FERTILIZER EXPERIMENT ON FIELD PEAS AT COTTONVALE, 1939.—Showing interactions between nitrate of soda (N), superphosphate (P), and sulphate of potash (K).

unusually poor germination of seed which ranged from 10 per cent. to 20 per cent. in the field. In these circumstances no quantitative results could be secured, but a most marked improvement in growth was obtained in plots receiving mixtures of fertilizers containing nitrogen. In these plots the plants made healthy growth under conditions imposed by severe frosts occurring sometimes below 10 deg. Fahr., and by winter drought which resulted from a fall of only 2·15 inches of rain during the five-month growing period of the plants. Frost injury in fertilized plots, all of which received nitrate of soda, could not be regarded as having been severe, and the plants reached a height of 12 inches. In

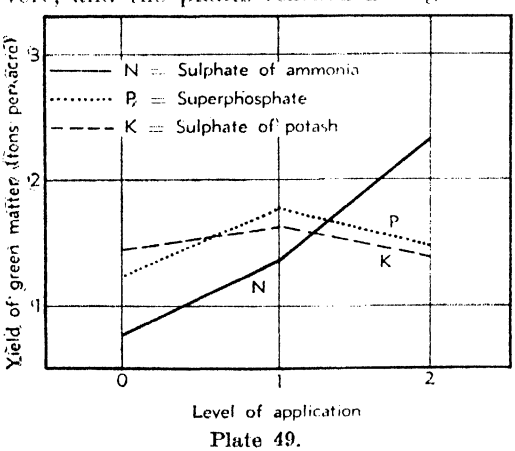


Plate 49.

FERTILIZER EXPERIMENT ON FIELD PEAS AT GLEN APLIN, 1939.—Showing interactions between sulphate of ammonia (N), superphosphate (P), and sulphate of potash (K).

unfertilized plots more than half the plants died, and those surviving were severely stunted, attaining a height of only 3 or 4 inches. It appeared from this result that the fertilizers were effective in increasing the resistance of the plants to frost and drought injury. Laboratory germination tests showed that 77 per cent. of the seed used in this experiment was viable. The cause of the particularly low germination in the field is under investigation.

Discussion on Fertilizer Experiments.

In all the experiments described above, nitrogenous fertilizers have given outstanding results. Cereal crops have responded very strikingly and consistently to applications of nitrate of soda and sulphate of ammonia, irrespective of whether they were applied alone or in combination with superphosphate or sulphate of potash, or with both these fertilizers. Average increases in the yield of green matter have been sixfold in old orchards of low vigour, and twofold in young orchards in which soil fertility was still comparatively high. Fertilizers containing phosphoric acid and potash have caused no marked response in any of the experiments on cereals, and in view of the healthy growth of plants in plots receiving nitrogen only, it appears that they received adequate supplies of phosphoric acid and potash from the soil. This does not prove, however, that the supplies of these elements are adequate for all crops which might be planted, nor even for a succession of green manure crops.

Responses by leguminous crops, whilst not as spectacular as those by cereals, have been none the less definite. With legumes, nitrogenous fertilizers again played a prominent part, and produced the greatest increases in yields of lupins and field peas, while superphosphate has caused small but significant increases on several occasions. The best results tended to be given by a mixture containing a nitrogenous fertilizer and superphosphate. Potash was responsible for a slightly increased yield in only one of the four experiments in which it was used on legumes.

The effect of nitrogenous fertilizers on the type of plant produced has been most striking, especially where cereal varieties are concerned. Cereals receiving treatments involving the application of superphosphate in the absence of nitrogen, whether or not potash was present, have invariably developed into spindly, stunted plants with only two to five tillers and sparse flag formation (Plate 50).

The colour of these plants was always pale-green to yellowish, a condition usually indicative of nitrogen starvation. Unfortunately, cereal crops consisting almost entirely of plants of this type are far too common in Stanthorpe orchards and vineyards. The growing of such crops as these plainly represents wastage in labour and materials. Where a nitrogenous fertilizer was applied at the time of sowing a cereal crop, a beneficial effect on growth was noticeable very soon after germination, and this effect became more and more marked as growth continued. The plants were very different from those described above, their colour now being a healthy deep-green, their rate of growth increased, and, most important, tillering and flag production multiplied many times, 12 to 30 tillers being produced per plant (Plate 50).

In legumes, nitrogen deficiency is most marked in the early stages of growth. Peas and lupins show this deficiency in the first few weeks after germination by the slow and stunted growth of the plants, and by

a red or crimson colouration of the foliage, especially in leaves near the base of the stem. As the plants grow older, newly-formed leaves may be a normal green colour, if root nodule bacteria have become active and are supplying the plant with nitrogen fixed from the atmosphere. In many experimental plots the plants did not reach this second stage, but remained stunted, unhealthy in colour, and often died. This would seem to indicate that in these cases not only was the soil very deficient in nitrogen, but also that the appropriate strains of nitrogen-fixing bacteria were absent.

Plate 50.

INFLUENCE OF NITROGEN ON GROWTH OF RYE PLANTS.—Plants on left typical of those from no-nitrogen plots. Plant on right from plot receiving 2 cwt. nitrate of soda per acre.

GREEN MANURE CROP VARIETAL EXPERIMENTS.

In experiments with green manure crops, the varieties were sown in randomised blocks each of which was replicated four times. In the first two years the plots were fertilized with 1½ cwt. of sulphate of ammonia, 1½ cwt. of superphosphate, and ¾ cwt. of sulphate of potash per acre, but subsequently potash was omitted. Methods of sowing and sampling the plots were the same as in the fertilizer experiments, and the usual observations on growth habits, reactions to climate, &c., were made.

1937 Experiment.

The varieties tested in 1937 were Dun field peas, tick beans, New Zealand blue lupins, subterranean clover, Florence wheat, and Cape barley. The experiment was so designed that a comparison could also be

made between legumes inoculated with the correct strains of nodule bacteria and those not inoculated.* Very little rain fell in the four months following the sowing of the crops, and this resulted in the failure of most varieties, so that no quantitative data were obtained. At the ploughing-in stage the growth made by the lupins was notably better than that of any other crop (Plate 51). The other legumes and the two cereals made very poor growth, but the clover plants were healthy and would probably have made good growth during the spring.

1938 Experiment.

The above experiment was repeated in 1938 on the same site at The Summit as was used in 1937, but with the addition of three other varieties, viz., rye, Golden tares, and red clover. The original varieties were sown in the same plots as they had occupied in the previous year, so that observations could be made in connection with the nitrogen-fixing organisms. The additional legumes were not inoculated.

During their growing period, the crops received sufficient rain to preclude the possibility of soil dryness being a factor limiting their growth, but the usual frosty conditions prevailed throughout. Under these generally favourable growing conditions the growth made by the different varieties was strongly contrasted (Plate 52). Since the clovers made very little growth they were not sampled and do not therefore appear in the table of results.

TABLE 3.

SHOWING RATE OF YIELD OF GREEN MATTER BY GREEN MANURE CROP VARIETIES. SEEDING RATE 80 LB. PER ACRE FOR EACH VARIETY. THE SUMMIT, 1938.

Variety.	Yield of Green Matter in Tons per Acre.	Variety.	Yield of Green Matter in Tons per Acre.
1. Dun field peas (*a*)*	1·51	6. Lupins (*b*)	10·50
2. Dun field peas (*b*)*	2·45	7. Golden tares ..	7·42
3. Tick beans (*a*) ..	3·24	8. Wheat	2·21
4. Tick beans (*b*) ..	4·41	9. Rye	2·59
5. Lupins (*a*)	10·72	10. Barley	1·52

Standard error .. .. .. ·321
Significant difference .. .. ·94

* (*a*) Soil inoculated with appropriate strain of root nodule bacteria ; (*b*) soil not inoculated.

In Table 3 the final results are expressed in terms of tons of green matter produced per acre. Field peas and tick beans made relatively poor growth when compared with lupins and Golden tares. A high proportion of the field pea plants was partly or wholly dried up, owing to their inability to withstand the severe frosts, whilst tick beans, although not showing frost injury, were rather stunted and produced an inadequate quantity of green matter. Nevertheless, this latter crop yielded significantly more than wheat and barley or peas on inoculated soil. Although the field peas and tick beans gave better results in 1938 than in the previous year, they did not make satisfactory growth in this experiment. However, apart from the experimental plots, field peas made relatively good growth in 1938 in a number of orchards where frosty conditions were less severe.

* Bacterial cultures for this and other experiments were supplied by the Waite Agricultural Research Institute, South Australia.


GOOD GRACIOUS!
How much we depend on
RED COMB
During the 12 months ended 30th June, 1941, The Poultry Farmers' Co-operative Society Ltd.
MANUFACTURED AND SOLD
252,069
BAGS OF " RED COMB "
Laying Mash
A Larger Quantity than ALL OTHER Merchants and Manufacturers in Queensland COMBINED


SIXPENCE
1936
SIXPENCE
IS ALL IT COSTS TO FEED A CHICK
ON
"HY-PRO"
Red Comb
HY-PRO
CHICKEN
MASH
TO 8 WEEKS OF AGE
Write to-day for your free copies of Poultry and Chicken Booklets
RED COMB HOUSE - ROMA ST. - BRISBANE

From Table 3 it is obvious that lupins and Golden tares made vigorous and extensive growth despite numerous frosts, and gave yields which amounted to more than 10 and 7 tons per acre respectively, and were thus outstanding as compared with any other varieties. From the figures it seems that these two crops can make sufficient growth between mid-autumn and early spring to produce a bulky crop of green matter provided they receive adequate fertilizer applications. The main grow-

A B C D

Plate 51.

CONTRASTS IN GROWTH MADE BY VARIOUS GREEN MANURE CROPS UNDER DRY WINTER CONDITIONS, 1937.—(A), Dun field peas; (B), tick beans; (C), Florence wheat; (D), New Zealand blue lupins.

ing period of the lupins, i.e., between germination and the commencement of flowering, amounted to 142 days, while that of Golden tares was about 165 days.

All of the cereal crops in the test made unsatisfactory growth, but significant differences were revealed. Barley, wheat, and rye were inferior to tick beans, Golden tares, and lupins, but rye gave better results than barley and field peas. The cereal plants were generally characterised by spindliness, poor flag growth, paucity of tillers, and paleness of foliage; while the barley was extensively attacked by rust disease. These conditions suggest deficiencies in soil nutrients, but since the plots received an application of 3¾ cwt. per acre of a mixture of sulphate of ammonia, superphosphate, and sulphate of potash (2:2:1), it would seem that the growth of the plants was limited by soil deficiencies other than of these particular elements. In other words, the soil requirements in this orchard were apparently not satisfied by supplying N, P, and K only. It is noteworthy that rye grown in a fertilizer experiment in another orchard during the same season made excellent growth, as can be seen from the results of the 1938 fertilizer experiment and from Plate 42. The growing periods of the cereals were—wheat 114 days, rye 125 days, and barley 120 days.

Plate 52.
GENERAL VIEW OF GREEN MANURE CROP VARIETAL EXPERIMENT, 1938.—Note strong contrasts between plots containing different varieties.

That legumes grown in plots which had been inoculated in the previous year did not differ significantly from those grown in uninoculated soil is not explicable from the information so far available. Root examinations revealed that the amount and type of nodulation on any one variety were somewhat similar, irrespective of whether or not the variety was grown in inoculated soil. In a legume experiment carried out in the winter of 1938 no significant differences in yield were shown between inoculated and uninoculated plants. These results suggest that

in this instance the growth of the legumes was limited by factors other than the presence or absence of suitable strains of bacteria, but it is not considered that this should be construed as meaning that these organisms are of little importance.

1939 Experiment.

The results obtained in the 1939 experiment, which included Golden tares, Purple vetch, tick beans, Grey field peas, Dun field peas, and rye, are shown in Table 4 in which low-yielding and high-yielding varieties are separated into two groups. In the former group, Purple vetch yielded less than any other variety, and the remaining two varieties gave comparable amounts of green matter. The yield given by Golden tares sown at the rate of 90 lb. per acre was equivalent to that obtained at 60 lb. per acre. Further, the combination of tick beans with Golden tares did not lead to any increase in the amount of the crop. The yield of some of the varieties in this experiment was influenced by the late sowing of the crops.

TABLE 4.

SHOWING RATE OF YIELD OF GREEN MATTER BY GREEN MANURE CROP VARIETIES. THULIMBAH, 1939.

Variety.	Rate of Seeding per Acre.	Yield of Green Matter in Tons per Acre.
1. Golden tares	90 lb.	2·5
2. Golden tares	60 lb.	2·7
3. Purple vetch	20 lb.	1·8
4. Tick beans and Golden tares	45 lb. each	3·2 (0·9 beans + 2·3 tares)
Significant difference 0·75 for varieties 1 to 4.		
5. Rye	90 lb.	4·3
6. Grey field peas	90 lb.	3·9
7. Grey field peas	60 lb.	3·6
8. Dun field peas	60 lb.	4·2
9. Grey field peas and rye	45 lb. each	4·2 (0·3 peas + 3·9 rye)
10. Golden tares and rye	45 lb. each	4·6 (0·3 tares + 4·3 rye)
11. Grey field peas and Golden tares	45 lb. each	4·0 (2·2 peas + 1·8 tares)
Significant difference 1·05 for varieties 5 to 11.		

In the second group all varieties and combinations must be considered as having given comparable results, since none of the differences in yield is significant. Grey field peas yielded the same amount of green matter when sown at the rate of 60 lb. per acre as when sown at the rate of 90 lb. per acre.

No increase in yields resulted when varieties were combined together in pairs, each at a reduced rate of seeding. In three of the four combinations one of the varieties was markedly predominant over the others. This was particularly evident in the rye-field peas and rye-Golden tares combinations in which rye formed 93 per cent. and 94 per cent. respectively of the total yields. The domination of rye was due to its growth being more rapid in winter than that of the other varieties. Observations on these plots suggest that the combinations would have been more effective if the relative seeding rates had been altered so that the amount of rye seed sown was considerably less than that of the legumes. In the field pea-Golden tares combination each produced much the same quantity of green matter, the total being made up of 55 per cent. field peas and

45 per cent. Golden tares. It is noteworthy that rye when sown at 90 lb. per acre yielded essentially the same quantity of green matter as when sown at 45 lb. per acre in combination with golden tares. This indicates that, within limits, heavier sowing of seed does not lead to increased quantities of green matter.

1940 Experiment.

Crops grown in the 1940 experiment were New Zealand blue lupins, Golden tares, Dun field peas, fenugreek, rye, and Sunrise oats. Just prior to sowing in early April the plots received 2 inches of rain, but in the ensuing five months only 2·15 inches of rain fell, little of which was effective. During this period of drought the plants were subjected to numerous and severe frosts, some of which occurred at grass temperatures in the vicinity of 10 deg. Fahr. Under these conditions the crops did not make much growth, but useful information was obtained on the drought and cold resisting qualities of the plants. Notes on the performance of the 1940 crops are included in the following discussion on varieties.

GENERAL NOTES ON VARIETIES.

The ability of the **New Zealand blue lupin** (Plate 53) to resist the droughty and frosty conditions which often occur in winter at Stanthorpe at once marks it as a desirable type of green manure plant for this district. Frost injury had not occurred in any of the lupin plots until the severe winter of 1940. At this time a few plants were killed and others bore an injury on the main stem near ground level. This damage did

Plate 53.
THREE PLANTS OF NEW ZEALAND BLUE LUPINS GROWN DURING AUTUMN AND WINTER, 1939.

not appear to interfere with the growth of the plants which generally remained healthy, though, of course, somewhat stunted by the drought conditions. Observations show that the degree of susceptibility of lupins to frost injury is considerably influenced by the vigour of the plants and that this susceptibility is increased particularly at the stages immediately after germination and just prior to flowering. Of the legumes under investigation this year, lupins were the least affected by frost, and further, the only effective leguminous crops observed in the district in 1940 consisted of lupins alone or in combination with Golden tares. The varietal experiments must be considered to have demonstrated that the lupin plant is well suited to local climatic and soil conditions, and it may be noted that this is in conformity with experience on similar soils in other parts of the world.

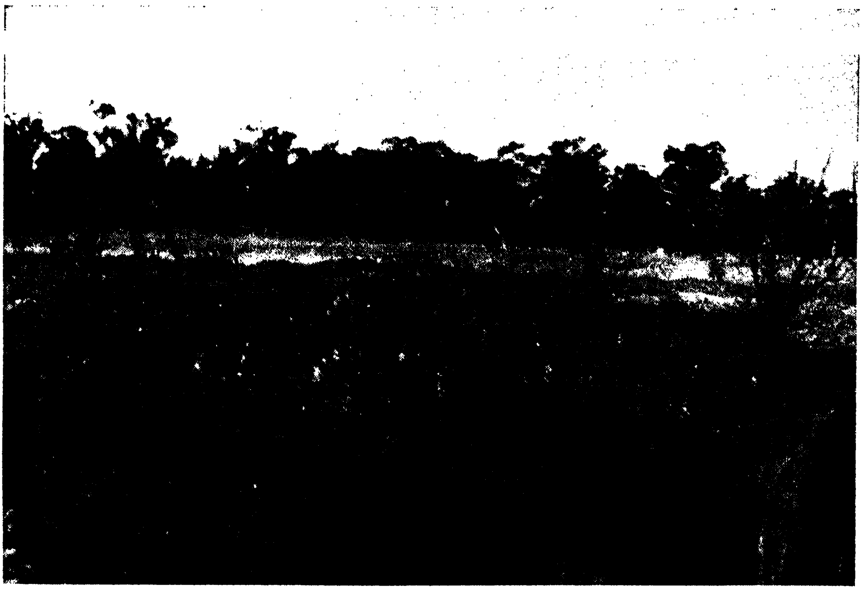


Plate 54.
NEW ZEALAND BLUE LUPIN CROP GROWN IN 1938 VARIETAL EXPERIMENT.—Some plots yielded 16 tons of green matter per acre.

In the various experiments lupins have yielded much more heavily than other legumes (Plate 54), and when compared with cereals have more than equalled an exceptionally good crop of rye. In some instances, however, lupins, in common with other legumes, do not give a really satisfactory yield of green matter in the first year of planting, but such an occurrence does not condemn the plant as being unsuitable. Improvements in growth in the second and subsequent years can be expected with the development of the correct strains of bacteria in the soil. The successful establishment of any leguminous crop under Stanthorpe conditions may require not only the use of fertilizers, but also the artificial inoculation of the seed with appropriate strains of bacteria.

Lupins do not make extensive winter growth, and it therefore appears to be necessary to sow the crop in time for it to receive the full benefit of autumn rains, and so that the plants will be well established before the winter. They make rapid growth in early spring. The lupin

plant contains an alkaloid which is present most abundantly at the stage of seed formation, and this alkaloid may be toxic to farm animals if sufficient of the plant be consumed.

Golden tares are capable of producing a heavy crop of green matter and seem to be well suited to local climatic and soil conditions (Plate 55). Although very resistant to cold, this variety may be damaged to a small extent by severe frosts, and in this respect is a little more susceptible than lupins. It withstands drought conditions very well. Its growing period is about three to four weeks longer than that of lupins, and for satisfactory growth it should be sown early in autumn. It breaks down rapidly after being turned under.

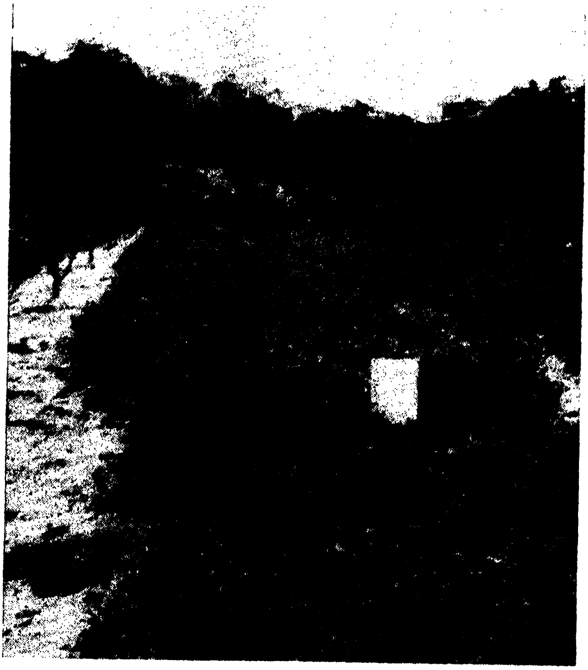


Plate 55.
GOLDEN TARES YIELDING 7 TONS GREEN MATTER PER ACRE, 1938.

Dun field peas have been used in the trials more than any other variety of field peas, and it is rather significant that the best yield given by this variety during the four years was 4.2 tons per acre. This cannot be considered a satisfactory quantity of green matter. Though the variety may be resistant to frosts of moderate intensity, it is often seriously injured or killed outright by severe frosts (Plate 56); in 1940 most of the field pea plots were completely destroyed by frosts. Grey or Partridge field peas were used only in 1939, when their yield was similar to that of the Dun variety. Their performance under intense frosts has not yet been determined in experiments. Although

Dun field peas are probably used more commonly in the district for green manuring than any other legume, their performance in comparative experiments does not suggest that they possess any particular merit to justify that popularity.

Tick beans make little growth in winter, but provided sufficient moisture is available, they can survive the cold and will make fairly good growth in autumn and spring. Although they appear to be more resistant to frost injury than Dun field peas, they seem to be very adversely affected by dry winter conditions, and for this reason they show little promise of being successfully employed as a regular winter green manure crop in the Stanthorpe district.

Plate 56.
DUN FIELD PEAS YIELDING 1·8 TONS PER ACRE, DAMAGED BY FROST, 1939.

Purple vetch is somewhat slow growing and under Stanthorpe conditions seems to be quite unable to yield a bulky crop of green matter. For optimum growth the plant apparently requires more winter rain than usually falls in this district. It may be noted that common vetch grows along orchard headlands and in other situations in a wet winter, but is not in evidence under dry conditions.

The experiments have shown that subterranean clover (*Trifolium subterraneum*), red clover (*T. pratense*), and Bokhara clover (*Melilotus alba*) are not suitable for winter green manure crops at Stanthorpe. When sown in mid- to late autumn germination is very slow, and growth made during the winter is negligible. These plants can withstand a considerable amount of drying out of the soil and are resistant to frost injury. Under favourable spring conditions they grow rapidly, and although they are not suitable as winter crops, it is considered possible that a method of using clovers sown in late winter to improve the humus and nitrogen content of the soil may yet be found.

Black Winter rye has several characteristics which make it superior in many respects to the various other cereals tested. This variety is highly resistant to frost and shows no sign of injury even when minimum grass temperatures fall as low as 10 deg. Fahr., except when in the flowering stage; the frosts in 1940 left the experimental crop unharmed. The plant is able to make a moderate amount of growth under very dry conditions, due no doubt to its extensive root system. It tends to run to stalk rather rapidly and should, therefore, be ploughed in at an early stage. If its moderate moisture requirements be satisfied the plant will continue to grow throughout the winter, and with a rapid increase of growth in early spring it will finally produce a large amount of green matter. The ability of the plant to withstand acid soil conditions and to make good growth in sandy soils is well marked. It is reported to make normal growth in soils which give rise to copper deficiency disorders in other plants (Riceman and Donald, 1939).* For these reasons rye is regarded as a very suitable cereal for green manurial purposes in the Stanthorpe district.

Wheat has not been used extensively in the experiments, but the available experimental and observational evidence suggests that, with suitable fertilizing and sufficient moisture, Florence wheat makes satisfactory growth as a winter crop, and is resistant to normal frosts. Wheat is, generally speaking, less tolerant to soil acidity than rye.

Barley has not given impressive results in field tests. It often shows unhealthy foliage colouration and lack of vigour under Stanthorpe winter conditions, and it seems to be more subject to disease, notably rust, than the other cereals tested. It is liable to injury by severe frosts. Barley is not very tolerant of acidity, and on this account local soils may impose a restriction on its growth.

Limited tests have shown that **Sunrise oats** may provide a good crop of green manure during winters in which abnormally severe frosts do not occur. Frosts developing at grass temperatures of about 15 deg. Fahr. and lower cause serious yellowing and subsequent death of much of the foliage, whereas under similar conditions rye is unaffected. Oats is recognised as a plant which tolerates soil acidity, and in this respect it compares favourably with rye and is to be preferred to barley.

GENERAL RECOMMENDATIONS.

The supplying of organic matter to Stanthorpe soils is of fundamental importance to the maintenance and improvement of soil fertility in the district and, therefore, it is recommended that green manuring be adopted as a routine practice in orchards, vineyards, and vegetable gardens. In this branch of farm work growers are urged to employ improved methods, for the sowing of untried varieties on unprepared and unfertilized land is certain to lead to the failure of the crop.

New Zealand blue lupins and Golden tares are legumes of outstanding merit for the Stanthorpe district. Lupins should be the first choice as they are quick-growing and best able to survive both frost and drought conditions, and in general they form an excellent type of green manure plant. A legume should not be judged on the growth made in the first

* Copper response on "Coasty" Calcareous Soils in South Australia. Riceman, D. S., and Donald C. M., Journal of Department of Agriculture, South Australia, Volume XLII., No. 11, 1939.

year of planting as two or three successive crops may be required before the variety reaches its maximum growth.

Black Winter rye is outstanding for its winter hardiness and drought-resisting qualities, and will generally make good growth as a winter crop. Sunrise oats and Florence wheat are in some respects also suitable varieties, but they are sometimes damaged by severe frosts. Cape barley is less satisfactory than the other cereals mentioned.

Seed should be sown in land which has been properly prepared by suitable cultivation. In the absence of a seed drill the seed should be buried, after broadcasting, preferably by means of a plough, rotary hoe, or cultivator, but harrows are fairly effective with most seeds. The recommended rates of seeding per acre are—(*a*) New Zealand blue lupins or Golden tares, 1 bushel for first one or two years, thereafter ¾ bushel; (*b*) Black Winter rye, Sunrise oats, or Florence wheat, 1 bushel.

The time of sowing is governed largely by autumn rainfall. Cultural preparations for the sowing of the crop should be made in March so that both soil and crop will benefit from any useful autumn rains. Early sowing is always preferable to late, as the plants should be well established before the approach of winter. Rye can be sown later than any of the other crops mentioned above.

Fertilizers should be broadcast and ploughed in in the course of the preparation of the seed-bed, and they can be applied advantageously one or two weeks before the seed is sown. Experience has shown that, although satisfactory results usually follow the simultaneous application of seed and fertilizer, fertilizers in close proximity to the seed may lower germination. The following rates of application per acre are recommended—(*a*) For legumes, 1½ cwt. sulphate of ammonia or 1¾ cwt. nitrate of soda together with 1 cwt. superphosphate in both cases; (*b*) for cereals, 1½ cwt. sulphate of ammonia or 1¾ cwt. nitrate of soda. Lower rates of application for both legumes and cereals can be used if the soil has recently received adequate nitrogenous fertilizers.

Unless the crop is turned under in good time the ratio of carbon to nitrogen in the plants becomes so wide, that is, the carbon content becomes large and the nitrogen content comparatively small that one of the important objects of green manuring, namely, increasing the amount of available nitrogen in spring, may be defeated. In cereals particularly the carbon-nitrogen ratio widens rapidly as the plants approach maturity, so that if a winter-grown crop is ploughed in after the seed-heads have begun to form, the amount of available nitrogen in the soil may temporarily be reduced at a time when the fruit trees particularly require that element. Such action is brought about by those soil bacteria which are largely responsible for decomposing the green manure crop, for they are forced to draw on the soil nitrogen for their energy requirements if they are unable to obtain it from the green manure crop itself. It is advisable, therefore, that green manure be turned under before the crop reaches the flowering stage and in time to allow of the decomposition of the plants, and the resultant liberation of nitrogen so that that element will be available when the trees require it in early spring. Young plants decompose more rapidly than mature ones, and legumes more rapidly than cereals and most other non-leguminous plants. As a general rule, non-leguminous crops (Plate 57) should be ploughed in six or seven weeks and legumes three or four weeks before the end of the dormant period of the crop plants they are intended to benefit.

SUMMARY.

The practice of green manuring is rendered difficult in the Stanthorpe fruitgrowing area by climatic and soil conditions. Limiting features of the climate are severe winter frosts and uncertain rainfall which frequently results in low soil moisture; whilst direct soil factors include unavailability of certain plant food elements and, to a less extent, soil acidity. Green manuring practices in local orchards and vineyards vary greatly, and adequate crops of green manure are not commonly produced.

Investigations were begun in 1937, firstly, to determine the fertilizer requirements of leguminous and cereal crops grown as winter green manure, and, secondly, to test potentially suitable green crop varieties. The results of four years' experimentation are reported.

Plate 57.

EFFECTIVE PLOUGHING-IN OF THE GREEN MANURE CROP ENSURES ITS RAPID DECAY.—Cereal crops should be turned under at least six weeks prior to the blossoming of the trees it is intended to benefit.

The fertilizer experiments with the legumes, lupins and field peas, have shown (1) that the yield of green matter is increased more by sulphate of ammonia and nitrate of soda than by superphosphate or sulphate of potash or any combination of the latter two; (2) that certain combinations of superphosphate and potash gave small but significant responses on peas, particularly when a nitrogenous fertilizer was included in the mixture. The results generally suggested that restrictions may be imposed on the growth of legumes not only by a shortage of nutritional elements, but also by other factors not yet fully determined.

Fertilizer experiments with cereals showed that nitrogenous fertilizers greatly improved the type of plant, and consistently caused striking increases in the quantity of green matter even in seasons of low rainfall. Phosphatic and potassic fertilizers gave no marked responses.

Various species of leguminous and cereal plants have been tested as winter green manure crops. New Zealand blue lupins and Golden tares are outstanding among the legumes for their ability to grow effectively despite severe frosts and periods of low rainfall. Dun field peas, commonly used in the district for green crops, are susceptible to injury from severe frosts, and seldom yield satisfactory amounts of green matter.

Of the cereals tested Black Winter rye proved the most outstanding in frost and drought resisting qualities. Sunrise oats showed that it could make extensive growth under normal winter conditions, but could not resist injury from the more severe frosts. Cape barley was the least satisfactory of the cereals.

General recommendations, based on experimental results and extensive observations, are given for green manuring in the Stanthorpe district.

MILLETS FOR FODDER PURPOSES.

The quickest growing fodder crops are the millets. Since the preparation of the land for winter cereals will probably be shallower than that necessary for maize and sorghums, millets should give the most profitable returns.

The millets—Japanese, white panicum, and giant setaria or giant panicum—are hardy plants and stand dry conditions well. They are quick growing and have supplied material for grazing within six weeks of planting. These plants, however, should not be grazed before the roots are sufficiently strong to avoid their being pulled up by stock; and where judiciously grazed under favourable weather conditions, a good ratoon crop can be expected of them.

Where the green feed is not needed millets make a good quality hay, if cut when the seed heads are formed and before the seed has developed. A delay in cutting occasions loss in several different ways, and it is better, if there is any doubt as to when the crop is to be cut, to err on the side of greenness rather than otherwise. If cut too green, the hay may cause a slight scouring of stock; but if it is too well matured a loss of digestible plant nutrients will result. Further, if such a free seeding crop is allowed to mature, the scattered grain will cause trouble in subsequent crops by the resultant volunteer growth, and the seed, if carried into the haystack or shed, provides food for mice.

With a desire to attain balance in their stock foods, farmers have successfully made light sowings of cowpeas with the millets for grazing purposes, thus increasing the protein content of their fodder and so improving their cream returns.

Millets also, especially in combination with coarse-stalked crops—such as maize and sorghum—make excellent silage; and since they produce 10 to 12 tons of green material to the acre under good conditions, they may be used most advantageously for that purpose.

Millets prefer a loam for maximum growth, but will grow on a wide range of soils; even poor lands if sufficient moisture is present will give payable yields. Early sowings can be made as soon as frosts are over and can be continued successfully until January and February. Only small areas should be planted in November and December to provide grazing, as the heavy summer rains in January are apt to prevent the harvesting of any surplus as hay.

For sowing 10 to 12 lb. of seed per acre are usually sufficient when broadcast and harrowed in. When sown for hay, or on rich soils, a heavier seeding (about 15 lb.) is frequently used with a view to producing a fine-stemmed crop. Too heavy a seeding (over 20 lb.), however, will not have this effect, since—especially during a short dry spell—the original stand is quickly reduced by competition sometimes even to meagre proportions.

Of the varieties white panicum is undoubtedly the most popular. A quick grower, it stools well and reaches a height of from 4 to 6 feet. It has a flat stem and makes a good bright hay of some commercial value. Japanese millet is slightly shorter in its mature growth, but is—especially in the earlier stages—an even quicker grower and heavier stooler than white panicum, and is most suitable for grazing. Giant setaria (or giant panicum) has also received some attention, and under favourable conditions good results are obtained. Under adverse conditions, however, it does not appear to give as good results as the other varieties.

The millets also are very useful in controlling summer weed growth, but, of course, should be taken out before the time arrives to begin preparing the land for autumn planting.

Poultry Farming in Queensland.

(*Continued from page* 116, *August,* 1941.)

THE STRUCTURE OF THE FOWL.

SKELETON.

Birds are vertebrates which are especially adapted for flying or running. Thus the forelimbs (the wings) and the hindlimbs (the legs) are not used simultaneously in progression, as occurs in most animals. The skeleton, as the framework upon which the muscles work, is specially modified to this end. In the flying birds there is great development of the forelimbs and attached muscles. In poultry, where the power of flight is largely lost, the forelimbs are comparatively weak and the hindlimbs relatively stronger.

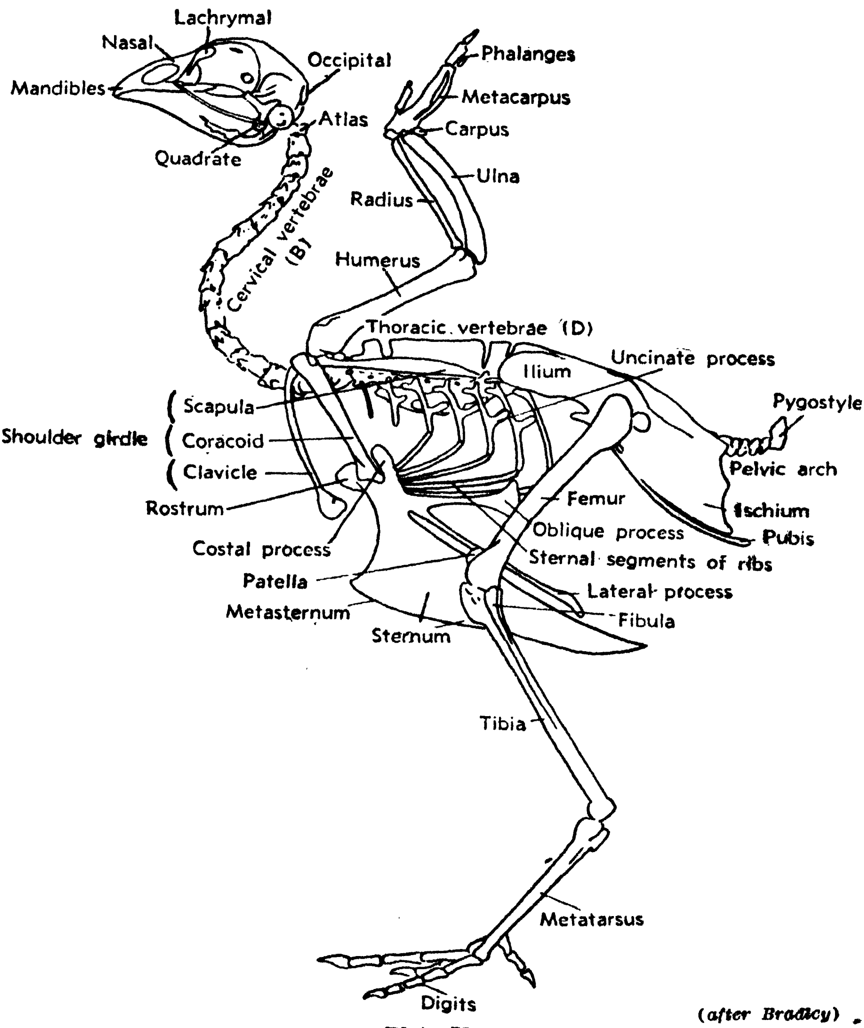


Plate 58.

THE SKELETON OF THE FOWL.

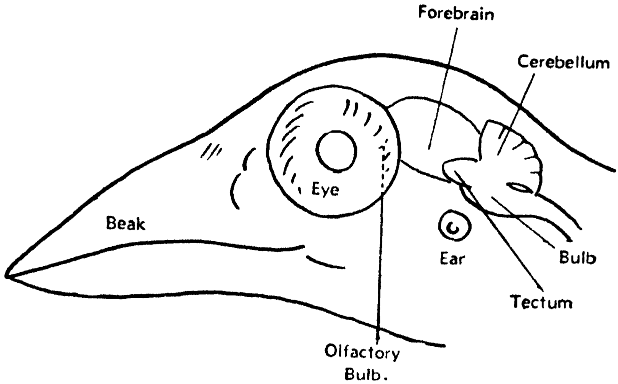


Plate 59.
THE SKULL AND BRAIN, SIDE VIEW.

In all poultry the skeleton is modified from that of other vertebrates in that—

1. The shoulder girdle consisting of the coracoid, clavicles and shoulder blade has been stiffened to make a firm fulcrum upon which the bases of the wing rest.
2. A keel for the attachment of large pectoral muscles has been developed along the sternum.
3. The bones are strong and light and contain air spaces which communicate with air sacs. These sacs are distributed in the dorsal part of the body, thus keeping the centre of gravity low, and contributing towards stability in flight.
4. The pelvic girdle (hip bone), composed of the ilium, ischum, and pubis, is incomplete ventrally to permit of the passage of the large size eggs through the genital passages.
5. And finally the vertebrae of the lumbo-sacral region are fused with the hip bones for increased rigidity. The air sacs not only contribute to stability, but also have a respiratory function. In the rumpless fowl the pygostyle and some of the coccygeal vertebrae are missing.

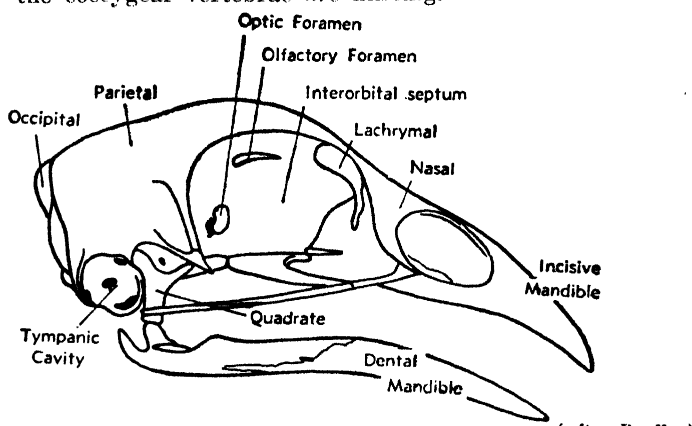


Plate 60.
THE SKULL.

The **Skull** consists of the following component parts:—

The *Lachyrmal Bone* forms part of the margin of each eye cavity.

The *Occipital Bone* forms the base of the skull and originally consists of four parts.

The *Quadrate Bone* is the bone between the lower jaw and the cranium (upper part of the skull), which permits of the mechanical movement of the mandibles.

The *Parietal Bones* are the pair of broad, short bones between the occipital and frontal bones.

The *Frontal Bones* are the large bones which can be divided into the frontal, nasal, and orbital parts.

The *Nasal Bone* is a thin plate notched at the opening of the nasal cavity; is one of the facial bones.

The *Optic Foramen* is the opening in the bone, through which the optic nerve (nerve to the eye) reaches the brain.

The *Olfactory Foramen* is a channel in the bones through which the nerve governing the sense of smell connects with the brain.

The *Tymphanic Cavity* is the cavity of the ear.

The *Interorbital Septum* is the inner partition between the orbital cavities.

Plate 59 indicates the situation within the skull, of the ear, eye, and brain.

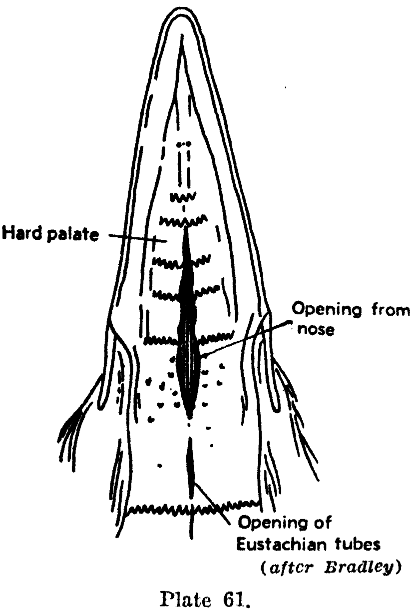


Plate 61.
ROOF OF THE MOUTH.

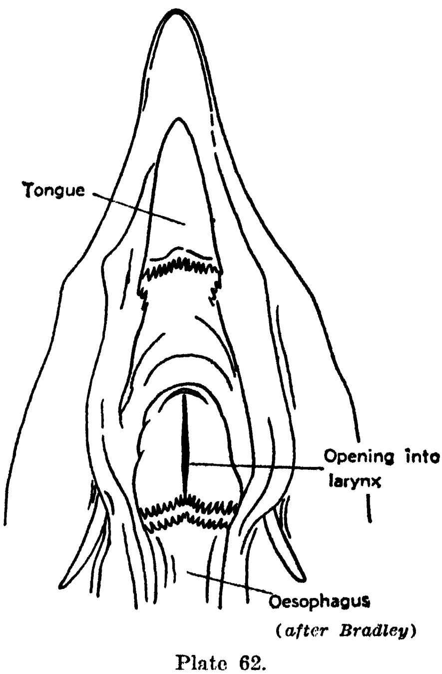


Plate 62.
FLOOR OF THE MOUTH.

The **Vertebral Column** is made up of the—

Cervical Vertebrae, consisting of the thirteen neck bones, of which the first is the *Atlas,* on which the skull rests. The atlas possesses a deep concavity which allows for the free movement of the skull.

Thoracic Vertebrae, seven in number, which carry the ribs. The second, third, fourth, and fifth bones of this section are fused together. The first two ribs are free, the others being attached by sternal segments (see Plate 58) to the sides of the sternum. The spread of the ribs has a direct relationship to the capacity of the lungs, heart, and liver.

Lumbar and Sacral Vertebrae, about fourteen in number, but merged into one bony mass.

Coccygeal Region, consisting of five or six bones, terminating in the pygostyle, the foundation of the tail.

The **Sternum** (breast bone).—This bone, in young birds, is most cartilaginous at the rear end. A serious fault is crookedness, which may be influenced by breeding, feeding, and perching. This bone articulates with the coracoid bone, and allows for the expansion of the abdomen when the bird is in production. The length of this bone is of considerable importance, as a long breast bone gives added support to the bird's abdomen and relieves the strain on the abdominal muscles. It is frequently found that the abdomens of birds with short breast bones sag, due to a rupture of the abdominal muscles.

The **Pelvic Arch.**—This consists of the ilium, ischium, and pubis. The *Ilium* is the largest of the section and is fused with that part of the vertebral column which contains the last thoracic, the lumbar, and sacral vertebrae. The inner surface provides the deep cavity in which the kidneys are lodged. The *Ischium* is much smaller than the *ilium.* The *Pubis* is the thin, narrow strip of bone running along the border of the *ischium,* being free at the lateral end. In young stock this lateral section is very easily injured in handling.

The pubic bones, when a bird is in production, are wide apart, but when not in lay they come much closer together at the free end. The distance between the tip of the sternum and the pelvic girdle is considered to some extent a measure of egg-laying capacity.

THE SKIN AND FEATHERS.

The skin is thin and contains no sweat glands, but over the base of the tail is a single oil gland, whose secretion the fowl uses when preening its feathers. The skin is divided into ten areas which grow feathers, called feather tracts or *pterylae.* The remaining spaces are devoid of feathers and are called *apteria.*

The feather tracts are situated as follows:—

1. Shoulder (humeral tract).
2. Thigh (femoral tract).
3. Rump (caudal tract).
4. Breast (pectoral or lateral tract).
5. Neck (cervical or anterior spinal tract).

6. Abdomen (ventral or inferior tract).
7. Leg (crural tract).
8. Back (dorsal or posterior spinal tract).
9. Wing coverts (alar tract).
10. Head (caput or head tract).

The colour of the skin varies from white to yellow, the latter being due to the presence of a fat pigment (lipochrome). The silkie appears to have a dark skin, but this is in reality due to the dark colour of the underlying tissues. In white-skinned breeds the bottoms of the feet are white and in yellow-skinned breeds yellow. Numerous nerve endings in it make the skin very sensitive, but the blood supply to it is small.

On the head the skin develops into special forms, e.g., the comb and wattles and ear lobes. The scales on the legs and feet, the toenails, and the horny covering of the spur are also derived from the skin.

Heat Regulation.—The body temperature of the fowl is higher than that of other animals, and more variable, with a daily range of from 105 deg. F. to 109·4 deg. F. The skin and feathers prevent undue heat loss. The skin itself, with its subcutaneous fat, acts as a sort of blanket and, in addition, the feathers prevent the cooling effect of air currents by the creation of a zone of still air imprisoned in their interstices. This protective area can be thickened at will when the fowl fluffs up its feathers, thus deepening the zone of still air surrounding the body.

Protective.—Skin and feathers protect the underlying tissues mechanically. The skin also is impervious to some liquids and gases that otherwise would be harmful and the feathers prevent direct moisture and sunshine from reaching the skin.

Sensory.—By its numerous nerve endings the skin supplies rapid information of change in its environment, e.g., temperature, pain, and enables the bird to make the necessary response, e.g., movement.

In addition, of course, the feathers assist in both flight and running, and by their diversified colouring and shape supply the external differences between the sexes. When it is considered that the whole feather covering is changed yearly and that it represents 4 to 9 per cent. of the body weight, it is apparent that it is an important item in the bird's annual production.

Feathers are the most important of the specialized skin structures. As well as protecting the bird they help to maintain the body temperature and are essential to flight.

A typical feather consists of a shaft (axis or scapus) and a web (vane or vexillum). Each feather grows from a papilla on the skin and is capable of being raised or lowered by small muscles attached to the base.

The free part of the shaft is the quill, and that supporting the web the rhachis. The quill is hollow and the rhachis solid and four-sided, tapering, and pliant. The web is made up of slender vanes (barbs) set obliquely to the rhachis. Each interlocks with its neighbours by means of slender barbules on each side. The edges of the barbules are provided with minute hooks which interlock with one another. By this means the web becomes matted into a continuous sheet capable of withstanding the pressure of the air in flight. Feathers, other than the true tail feathers and the primaries and secondaries of the wing, are considerably modified

to adapt themselves to the various parts of the body they cover. The down feathers have no barbules for interlocking. A flight feather, with a web 6 inches long, has some 1,200 barbs and about 1,000,000 barbules, besides an immense number of the microscopic hooks which are attached to each barbule.

MUSCULAR SYSTEM.

The flesh of poultry is composed of *voluntary muscles* similar to but paler in colour than those of the ox and sheep. The internal organs contain small quantities of *involuntary muscles,* so called because they are automatic in action and not under the direct control of the will. The *heart muscle* is a special sort of involuntary muscle.

The voluntary muscles do the active work of the body and are attached at one end—called the *origin*—to the central framework of the skeleton and thence run outwards to be attached by tendons, or directly to the bones they are to move. (This end is called the *insertion.*) Where tendons run over joints or bones they are held in position by bands of fibrous tissue or ligaments.

The *Diaphragm.*—This muscular partition between the chest and abdomen of mammals is almost entirely absent in poultry.

The *Pectoral Muscle* is the largest of the body and, with the smaller supracoracoid underlying it, makes up the breast of the fowl and is equal in weight to all the remaining muscles. The *origin* is the sternum and adjacent parts, and *insertion* is in the humerus, near the shoulder joint. The *action* of the pectoral muscle is to depress the wing in flight; hence the necessity for its great size, even in those birds which no longer fly but still use their wings in fighting and running.

The *Supracoracoid Muscle* has its origin in that part of the sternum which is not occupied by the pectoral muscle. The *insertion* is by means of a rounded tendon through the shoulder joint to a point opposite the insertion of the pectoral muscle on to the humerus. The *action* is opposed to that of the pectoral muscle—*i.e.,* it raises the wing in flight.

The *Ptagium* is a fold of skin stretching between the ribs and the arm and forearm. It contains elastic fibres and muscles and assists in folding the wing.

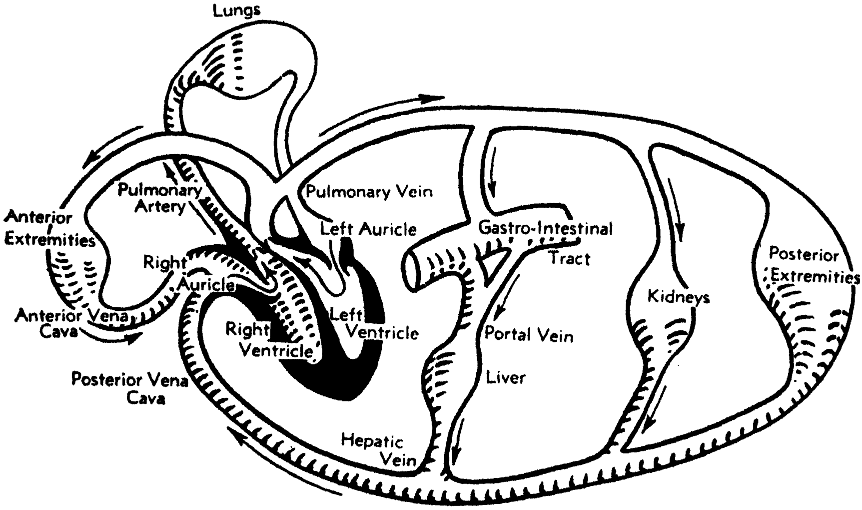
The leg muscles are small and numerous. Their tendons often become ossified in old birds and hence are best removed when dressing poultry for the table. Bending of the joints of the legs, as in perching, causes the toes also to flex, due to a pulley-like action of the long tendons over the tibio metatarsal joint, thus maintaining the grip during sleep.

The involuntary muscles are small in bulk but widespread throughout the body, occurring in the walls of hollow organs, such as blood vessels and stomach, intestines, &c. Their functions are automatic and consist in maintaining the continuous processes of digestion, circulation, excretion, and so on of the healthy body.

THE CIRCULATORY SYSTEM.

The circulatory system consists of the heart, arteries, veins, and blood. The heart is a muscular pump supplied with valves, which sends the blood in a continuous stream throughout the arteries to all parts of

the body. Thence it is returned by thin-walled tubes (the veins) to the heart. The arteries have thicker walls than the veins as they contain elastic and muscle fibres. The heart is relatively large. It is enclosed in a membrane—the pericardium—and is situated between the lobes of the liver. Communication takes place between the terminations of the arteries and veins by hair-like tubes called capillaries. The chief vessels leaving the heart may be seen in Plate 64.



(*after drawing in "The Physiology of Domestic Animals" by H. H. Dukes, D.V.M., M.S.*)

Plate 63.
THE CIRCULATORY SYSTEM.

The blood consists of the following elements:—

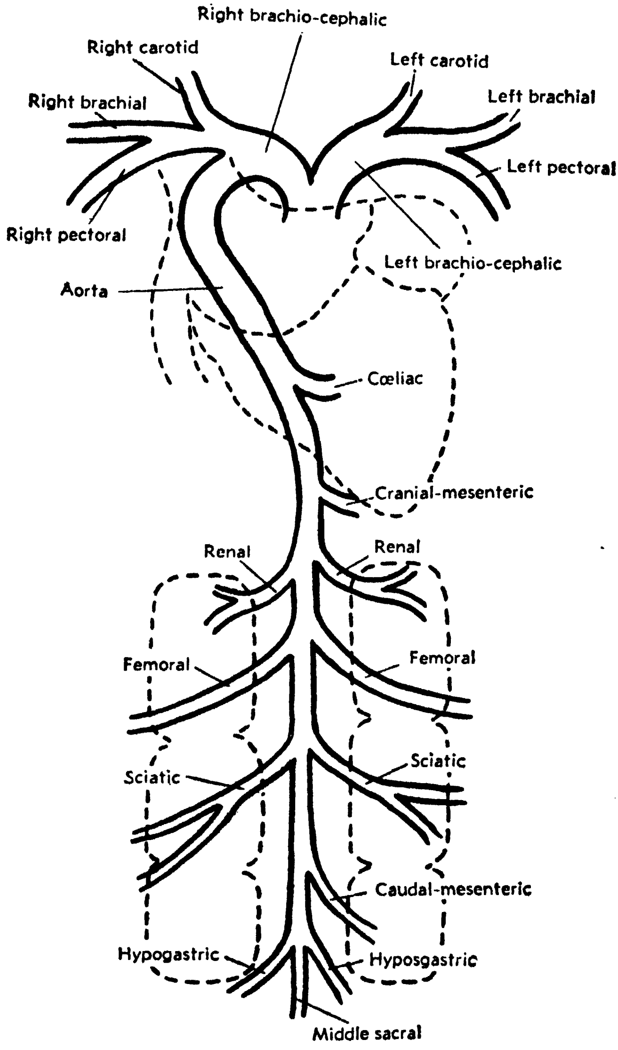
Plasma.—A pale fluid, which conveys the red and white cells;

Red Cells.—(Erythrocytes) which contain a red pigment called haemoglobin, and are carriers of oxygen;

White Cells.—Fewer and larger than the red cells. They have the power of destroying injurious invaders of the blood.

The function of the circulatory system is to supply freshly oxygenated blood to all parts of the body. In addition to oxygen the blood contains nutrient substances in soluble form for the nourishment of the tissues. The venous blood on its return carries waste products and burned oxygen in the form of carbon dioxide for excretion through the lungs. If reference is made to Plate 63 it will be seen that freshly oxygenated blood reaches the left side of the heart by the pulmonary arteries. From that it is pumped along the great vessels to reach the most distant parts of the body. In the digestive tract it receives nutrients which are delivered to the liver, where they are purified and made more assimilable, and thence reaches the venous stream and the right side of the heart. In the kidney certain waste products are collected and discharged through the ureters. All returning venous blood enters the right side, and from there passes to the lungs, where oxygen is received and moisture and carbon dioxide is given off. From the lungs the purified blood bearing its load of nutrients returns to the left side of the heart, thus completing the cycle.

The heart is composed of cardiac muscle, and is under involuntary nervous control. It contracts at a very rapid rate—normally about 300 beats per minute.



(*after Bradley*)

Plate 64.
DIAGRAM OF CHIEF ARTERIES.

RESPIRATORY SYSTEM.

The respiratory organs consist of the nostrils, glottis, upper or superior larynx, the trachea, the lower larynx or syrinx, the bronchi, air sacs, and the lungs.

Nostrils are small openings at the base of—and on both sides of—the beak, connected to the opening (slit) in the roof of the mouth.

Larynx.—The larynxes are valves at both ends of the trachea, known as the *upper,* situated near the base of the tongue, and the *lower,* situated

at the junction of the trachea and bronchi. The lower is at times termed the *syrinx,* or true larynx, by virtue of its being provided with vocal cords. The upper is much larger than the trachea, it being a very hard, cartilaginous or bony structure and operated by strong muscles. The lower larynx is of cartilage and is flattened.

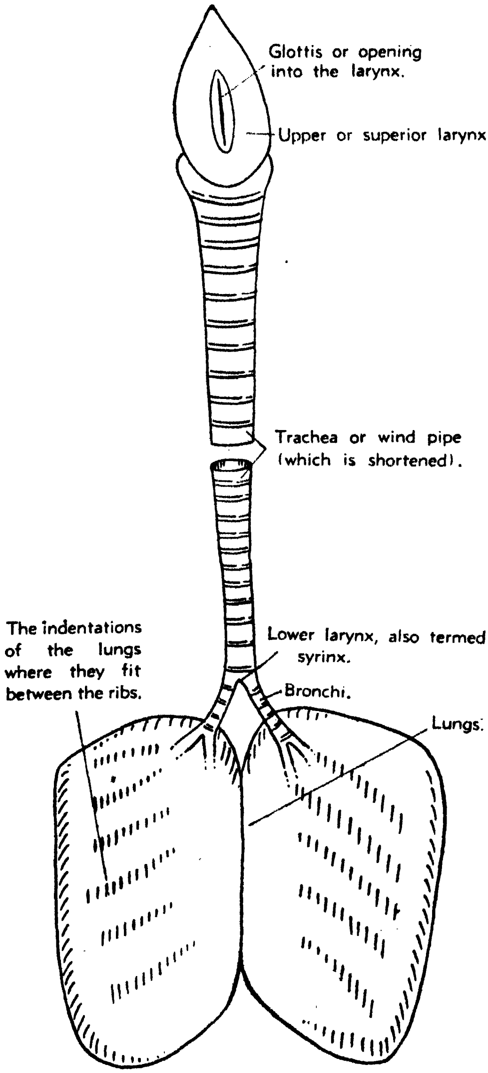


Plate 65.

ORGANS OF RESPIRATION.—An Explanation of the Trachea and Lungs.

Trachea.—Commonly known as the windpipe, made up of numerous round rings of cartilage joined by narrow membranous ligaments.

Bronchi.—The trachea divides at the lower larynx into two tubes known as bronchi, one going to each lung.

Bronchioles are further subdivisions of the bronchi, which form into air cells of the lungs. Other bronchial tubes supply air to the air-sacs of the body.

Air Sacs.—These are nine in number, communicating with the bones of the limbs and body on the one hand and with the bronchi on the other. They confer lightness and buoyancy to the body. The air sacs are named as follows:—

A single *clavicular* sac, placed behind the clavicle bone and continued on each side as an *axillary* sac, which supplies air to the sternum, sternal ribs, shoulder girdle, and humerus.

Above and behind the clavicular sac are two *cervical* sacs, which supply air to the thoracic vertebrae.

Then there are two *thoracic* sacs, which do not supply air to any bones.

Encasing the abdominal organs are two large *abdominal* sacs, which supply air to the sacrum, hip bone, and femur.

Air sacs are developed to a greater degree in flying and water fowls than in running birds.

Lungs.—The lungs, bright-pink and sponge-like, are applied closely to the under side of the back. They reach from the first rib in front to the kidneys behind. They are composed of air cells lined with a thin membrane and richly supplied with blood. Through this membrane takes place the interchange of gases between the blood and the inspired air, which gives fresh oxygen to the blood and removes the used-up air in the form of carbon doixide. The air cells are supported in a sort of elastic network.

The respiratory system of birds differs greatly from that of other animals; the lungs are small and the bony wall surrounding them cannot expand, so that the active part of breathing is *expiration* and not *inspiration,* as in man. The air sacs are peculiar to birds, and with the hollow bones form an extensive reservoir of air in communication with the lungs.

In breathing, air is drawn through the nostrils and enters the mouth through the slit in the hard palate. Thence it passes through the cranial larynx down the trachea to the syrinx, which is the true sound-producing organ. The bronchi conduct the air from here to the lungs.

Through the thin membrane lining the air cells fresh oxygen passes to the blood, and from it moisture and carbon dioxide pass to the air cells and are exhaled through the contraction of the involuntary muscles, which form part of the framework of the lungs. The lungs are restored to their former size after breathing out by their elastic fibres, and so the process is repeated.

Birds may occasionally breathe through the open mandibles, but it is generally a symptom of some obstruction of the respiratory tract or else because of very hot weather and an endeavour to increase the rate of cooling of the body.

THE DIGESTIVE SYSTEM.

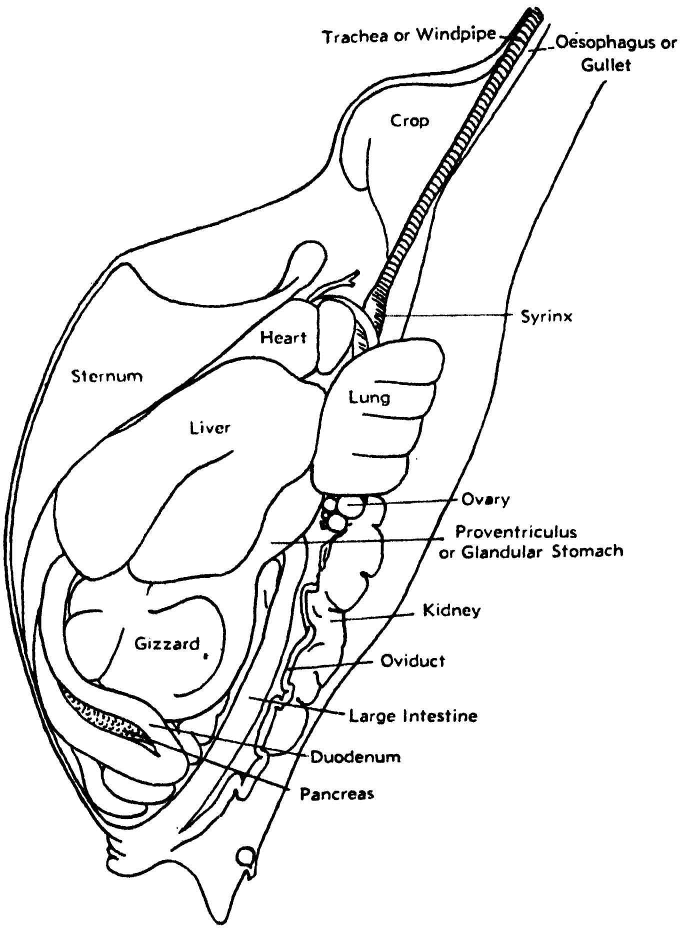
The digestive system consists of the following organs:—

Mouth.—Containing the tongue and the glands, which supply moisture to enable the bird to swallow food.

Tongue.—Narrow and pointed. The tip is horny and the rear part carries a transverse row of simple, large, and horny papilla (a nipple-like protuberance) directed towards the gullet. There are also similar papilla on the roof of the mouth.

Oesophagus.—Is the tube leading from the mouth to the proventriculus, interrupted by the distension known as the crop. The oesophagus is frequently termed the gullet.

Crop.—The food reservoir formed by a one-sided distension of the oesophagus, situated in front of the base of the neck and lying to the right. The crop may contain, with comfort, from 4 to 6 oz. of food, due to the elasticity of its walls. From the mouth to the crop there are numerous glands secreting juices which, while not of a digestive nature, tend to moisten and soften the food. The crop itself is glandless.



(*after Bradley*)

Plate 66.
THORACIC OR ABDOMINAL VISCERA.

Proventriculus.—Commences about 2 inches to 3 inches from the crop and extending to the gizzard. It is enlarged, being about ¾ inch in diameter, and is from 1½ inches to 2 inches in length; the walls are thickened and on the inner lining there are a large number of glands; it is also called the glandular stomach.

Gizzard.—The largest single organ of a fowl, located next to the proventriculus; of great muscular strength, reddish in colour, of uneven

shape. The inner lining is thick and horny and raised into ridges. Grit is collected in this organ to aid in the crushing and grinding of food.

Liver.—Is the largest gland in the body and consists of two lobes —right and left—more or less flat, very thin at the edges. It is situated behind and below the heart and is reddish-brown in colour.

Gall Bladder.—Is attached to the liver between its two lobes and is an elongated, greenish organ. Two ducts carry bile from it into the duodenum.

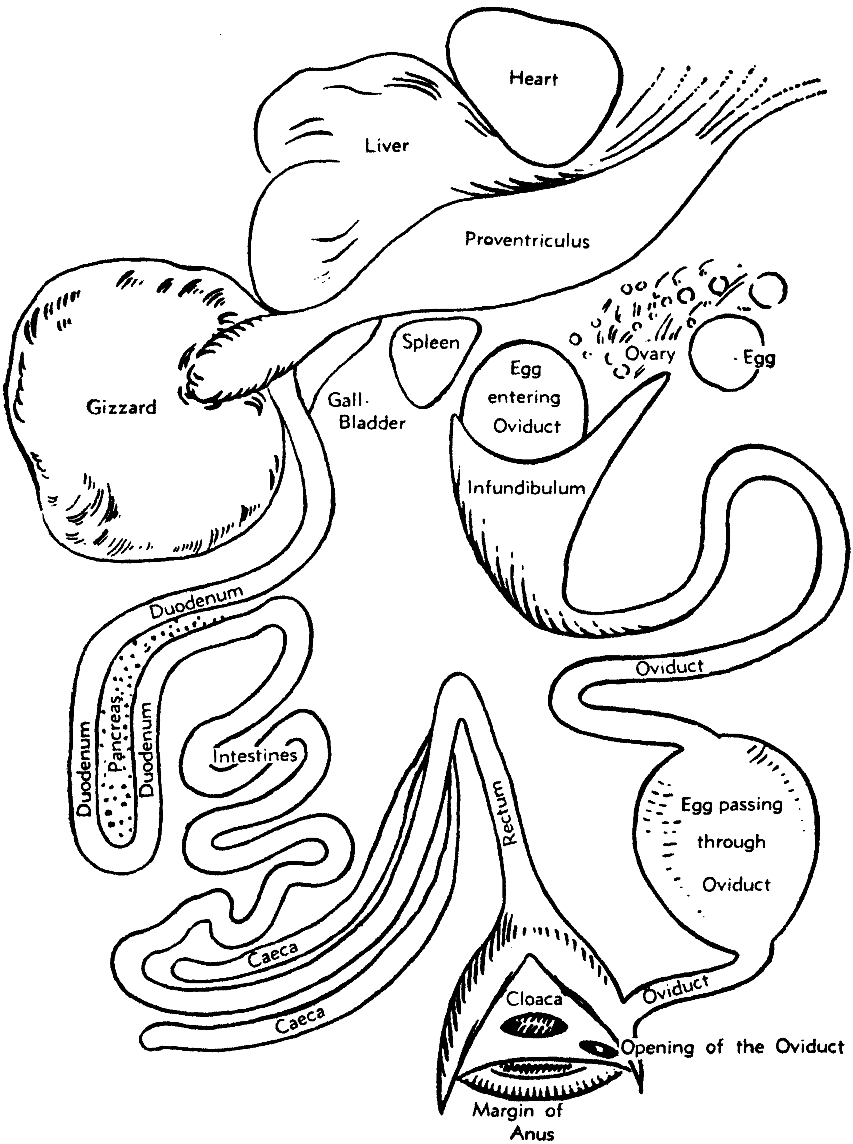


Plate 67.
ORGANS OF DIGESTION AND REPRODUCTION.

Pancreas.—A long, creamy-white coloured organ about 5 inches in length, suspended in the loop of the duodenum. Several ducts carry its secretion into the duodenum.

Mesentery.—A thin membrane attached to the small intestines, containing lymphatic and blood vessels.

Duodenum.—The first portion of the small intestines, attached to the gizzard. It is in the form of a loop, which supports the pancreas.

Jejunum and Ileum.—That portion of the intestines from the duodenum to the junction of the caeca.

The whole length of the small intestine is lined with intestinal glands, which secrete digestive juices.

Caeca.—The two tubes situated at the junction of the small and large intestines; these are 5 inches to 7 inches long, often referred to as "blind guts."

Large Intestine.—Is very short, slightly thicker in diameter than the small intestine. It continues in a straight line from the small intestine as the *colon* to the *rectum* and terminates in the *cloaca.*

Cloaca.—Is the terminal dilation of the large intestines and is common to the digestive, reproductive, and urinary organs. It, therefore, has the following important functions to perform:—To receive and excrete the undigested food and waste products from the kidneys; the passage of eggs; and the reception of sperm from the cock in copulation.

Vent.—The exit of the cloaca.

Before food can be digested it must be broken down into small fragments, and, as the fowl does not possess teeth, this function is performed by the gizzard, which uses its gritty contents as a sort of mill. Were it not for this, the tough covering of the various grains which are swallowed whole by the fowl would prevent their digestion by the secretion of the digestive organs.

These secretions are prepared by different parts of the digestive tract, beginning with the mouth. Their function is to convert the non-digestible foodstuffs into digestible particles, which can be absorbed into the blood-stream through the innumerable, fine, hair-like villi that line the small intestine.

Of the food entering the fowl, some is used for supplying energy, some for growth and maintenance, some for production—*e.g.*, eggs and feathers—some is stored in the muscles, liver, and fat, and the balance—mostly consisting of indigestible substances, such as fibre—excreted as waste. If the crop and gizzard are empty, as when the bird has not been fed for some hours—the first food seized passes directly to the gizzard in about thirty seconds. If the gizzard is occupied with grinding, food is stored in the crop and passes onward only as required. This mode of entry is a means of protection, a legacy from a wild ancestor, enabling the bird to fill the crop rapidly on the ground and then return to a tree to digest it in safety.

To reach the gizzard food must pass through the proventriculus, but stays there only a few seconds.

After being ground in the gizzard, the food reaches the small intestine and passes slowly along it by means of rhythmical contractions of

its walls. The two blind caeca at its junction with the large intestine also contract and expand and seem to increase the fluidity, so that the contents pass easily to the cloaca where they accumulate and are ejected from time to time. In the laying hen, from the time food is picked up approximately two and a-half hours is needed for its unabsorbed portion to reach the cloaca. In the non-laying hen, this period is increased to about eight hours and in the broody hen is longer still, being in the neighbourhood of twelve hours.

Below are summarized the processes taking place in the different parts of the digestive tract—

Mouth and Gullet.—The ferment ptyalin begins the conversion of starches into maltose;

Crop.—The conversion of starch is continued;

Proventriculus.—The ferment pepsin begins the conversion of proteins into simple forms;

Gizzard.—All the above processes are continued during the grinding;

Small Intestine.—A number of secretions from the pancreas and small intestine itself complete the conversion of starches and proteins into available forms—*i.e.*, glucose and amino acids and also change fats, which have reached here largely unchanged, into available fatty acids.

Absorption of these available forms then takes place through the villi that line the small intestine, and the waste products pass to the exterior via the large intestine and cloaca.

Digestion is rarely complete, and absorption still less so, especially when overfeeding is associated with lack of exercise or the food ration is an unbalanced one, or when both these conditions occur simultaneously.

URINARY SYSTEM.

The two *kidneys* are closely applied to the dorsal wall of the abdomen behind the lungs. Each is divided into three or four lobes and is joined to an opening in the cloaca by a comparatively straight tube—the *ureter*. The substance of the kidney is formed of numerous fine tubules, whose ducts coalesce to discharge their contents into the ureters and by this means reach the cloaca. The kidney is very richly supplied with blood.

Certain waste products are collected from the blood-stream by the kidneys and excreted with the cloacal contents as a whitish, pasty mass, which is the equivalent of urine in other animals.

THE REPRODUCTIVE AND GENITAL ORGANS.

Female.—Only the left ovary and oviduct reach maturity, though both right and left are present in the embryo.

The ovary lies below the front half of the kidneys. It is composed of a number of rounded, yellowish bodies (ova) in different stages of development. If examined in the laying season there will be all stages up to that in which the ripe ovum—the yolk of the completed egg—is ready to be released into the oviduct.

Each ovum is surrounded by its own vitelline membrane and is attached to the ovary by a thin membranous envelope—the follicle. The whole ovary is so surrounded by other organs as to be in a sort of pocket—the only escape from which is through the expanded end of the oviduct—the *infundibulum.*

There may be 3,000 or 4,000 ova present in the ovary at one time.

The oviduct is a coiled tube extending from the infundibulum, in the vicinity of the ovary, to its opening into the cloaca. It is of varying diameter, and may be divided into five parts, some of which secrete the albumen, membranes, and shell which are necessary to complete the egg.

These parts are named as below:—

(1) Infundibulum—approximate length, 2 inches.
(2) Magnum—approximate length, 14 inches.
(3) Isthmus—approximate length, 4 inches.
(4) Uterus—approximate length, 5 inches.
(5) Vagina—approximate length, 5 inches.

The oviduct is supported by membranous dorsal and ventral ligaments. Its wall contains muscular tissue, which increases towards the cloacal termination, and is greatest in the walls of the uterus. The magnum, isthmus, and uterus contain glands which secrete the albumen (white) shell, membrane, and shell, respectively, during its passage to the exterior. In a non-laying hen the oviduct may be only 4 inches long and ¼ inch wide, whereas in full lay it may increase to 20 inches in length, with corresponding breadth.

The functioning ovary contains ova at all stages from the microscopic to the rounded yellow "yolk" ready to be fertilized, and about to be released into the infundibulum.

This release is effected by rupture of the fine membrane—the follicle—investing it.

Once received into the beginning of the oviduct, the ovum is surrounded by fluids containing innumerable spermatozoa. Several of these may pierce the germ spot, but only one unites with the female cell contained in it to form the fertilized cell from which the chicken will develop.

Progress down the oviduct is maintained by wave-like contractions of the muscular wall. The whole time spent in the oviduct is about twenty-five hours, as shown in the table below:—

Section of oviduct	Process occurring	Time spent
Infundibulum	**Fertilization**	**approx. ¼ hours**
Magnum	**Deposition of thick albumen** ..	**" 3 "**
Isthmus	**Formation of shell membranes** ..	**" 1¼ "**
Uterus	**Formation of thin albumen and deposition of shell**	**" 20½ "**
		25

The egg passes to the vagina from the uterus when it is ready for laying, and normally its stay there is only a matter of minutes.

As a rule, ovulation—that is, the release of the next yolk into the mouth of the oviduct—follows the laying of the egg at an interval of about half an hour.

In the magnum, which comprises about half the length of the oviduct, the thick albumen is deposited on the yolk. It equals about half the total "white" of the completed egg, and can be plainly seen in a fresh egg broken into a dish as it stands up as a sort of plateau around the yolk, while the thin albumen flows around its base in a thin sheet. In stale eggs this differentiation is not noticeable.

In the Isthmus the shell membranes are formed. They are loosely applied, as they must leave room for the balance of the white which is to come.

In the Uterus the secretion of the thin white through the porous shell membranes, and the deposition of the shell, take place simultaneously in the early stages. The secretion of the thin albumen—some 40-50 per cent. of the total "white"—occurs in the first few hours, and the balance of the twenty odd hours spent here suffice to complete the shell ready for laying.

Male.—The two testes each have a tube—the deferent duct—leading to a small eminence on the wall of the cloaca. They are egg-shaped bodies placed ventral and anterior to the kidneys. The left is often larger than the right, and their size increases during the breeding season. The medial border of each is slightly concave. From this arises the "deferent" duct, which pursues a wavy course lateral to the ureter to open into the cloaca, on a small papilla.

Each testis is composed of much-coiled tubes—the seminiferous tubules—lined with epithelium from which the sperms are derived.

The male reproductive cells—spermatozoa—produced in the testis become motile in the deferent duct. Each duct terminates on a papilla on the dorsal wall of the cloaca, and is capable of injecting a large number—up to several million male cells—into the cloaca of the female during copulation. These spermatozoa then pass up the oviduct and occupy the infundibulum when the ovum is engulfed in it after ovulation. Only one of the male cells penetrates the germ spot and unites with it to form the fertilized ovum, from which will develop the chicken.

Male cells can live for about ten days in the oviduct, but then rapidly disappear, though fertile eggs have been obtained twenty-one days after the last mating.

The male cells, although microscopic in size, resemble a tadpole in appearance, and their long motile tail enables them to progress up the oviduct so rapidly that a fertile egg may be obtained twenty-four hours after mating. But in practice five-seven days is allowed before a high percentage of fertile eggs may be counted on.

THE EGG.

The shell consists of three layers and is porous. Externally is a delicate membrane, the shell cuticle or *bloom*. Beneath this is a spongy layer of calcareous fibres, and beneath this again is the *mammillary layer* consisting of conical masses of calcareous material, with air spaces between them.

The shell membrane lies between the shell and the white. It consists of two layers, which are closely applied to the shell and to one another, except at the large end, where they separate to form a space of variable size—the *air chamber*.

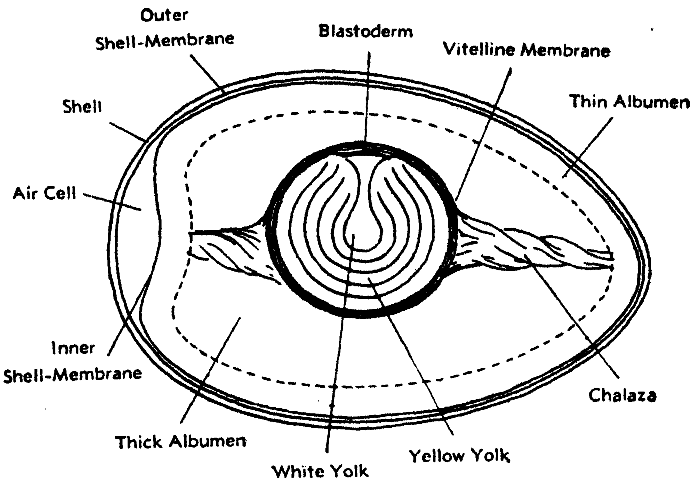


Plate 68.
THE EGG.

The albumen or white of the egg occupies the space between the shell membranes and central rounded yolk. Two cord-like thickenings of albumen arranged about the long axis and attached to the vitelline membrane are called the *chalazae*. About half of the white is formed of dense albumen surrounding the yolk and chalazae. Outside this is a more fluid layer, constituting the balance of the albumen.

The *yolk* is surrounded by its vitelline membrane. It is spherical, and composed of yellow and white material. The latter is arranged as a central flask-shaped mass and thin concentric layers separating thick layers of yellow yolk. A disc-like pale patch, about three-sixteenths inch in diameter on the yolk, is the *blastoderm,* or germ spot, a group of cells from which the chicken develops in incubation. In whatever position the egg is placed, this area is found at the top.

ENDOCRINE GLANDS.

These glands have no ducts of their own, but are usually well supplied with blood, and by this means their secretions reach the main blood streams.

They have a profound effect on the appearance and function of the bird. An example of this is seen in the cockerel whose testes are removed, resulting in the loss of most of the male characteristics. Their secretions are called hormones. They are essential to the normal function of all animals. The chief ones in the fowl are—

The testes—already described.

The ovary—already described.

The thyroid.—This gland is composed of small oval paired bodies located just within the thorax close to the jugular veins.

The spleen is a small, reddish-brown, rounded organ lying immediately to the right of the junction of the gizzard and true stomach. It is very richly supplied with blood by the splenic artery.

The thymus.—A lobulated body extending the length of the neck. It is only well developed in chickens and diminishes in size with age.

The adrenals are paired oval bodies about ½ inch long, lying medial to the anterior lobe of the kidneys.

The hypophysis or pituitary body is a small rounded mass attached to the base of the brain by a hollow stalk.

(TO BE CONTINUED.)

FOR ANGLE POSTS.

"The correct manner to stay an angle post is that adopted by the Post and Telegraph Department and the electric power boards. They have a far greater

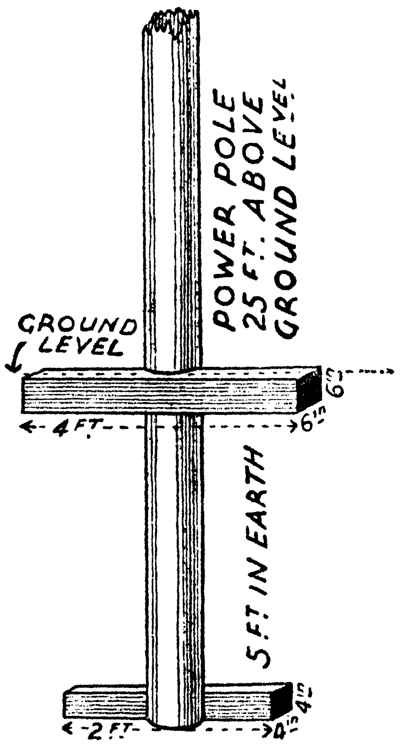


Plate 69.

leverage on a 30-foot power pole than a 4-foot fencing post, and they don't use a stay or strut. The sketch illustrates the method used."—"Ponga," in *The New Zealand Farmer Weekly.*

Seed Treatment of Sorghums.

R. B. MORWOOD, M.Sc., Research Officer.

WITH the recent increase in the popularity of sorghums as a crop, both for fodder and grain purposes, greater attention has been drawn to their diseases. One of these—covered kernel smut caused by the fungus *Sphacelotheca sorghi*—appears to be on the increase. While no great loss has yet been reported due to this disease, it is as well to take precautionary measures before such occurs. Accordingly, an experiment was laid out in the 1940-41 season to test the standard seed dust treatments on sorghum seed. The variety Wheatland Milo was used, the seed being first heavily dusted with spores from a mixed collection of smutted sorghum heads made the previous season. Five different dust treatments were carried out on samples of the smutty seed, and, together with an untreated control, they were planted in plots of two rows half a chain long. The plots were randomised and replicated four times. The dusts were applied at the rate of 2 oz. per bushel.

Results were obtained by counting the total heads and the smutted heads in each plot. The average percentage of infected heads for each treatment is given in the following table:—

TABLE I.

Treatment.	Percentage Infected Heads.	Significantly Better than—
(1) Copper carbonate	0·4	4–5–6
(2) Mercurial dust A	0·4	4–5–6
(3) Mercurial dust B	0·8	4–5–6
(4) Cuprous oxide	2·8	5–6
(5) Mercurial dust C	9·0	..
(6) Nil	10·8	..

The three leading dust treatments are considered to be effective measures for the control of the disease, and if they are used by farmers planting sorghums this crop should soon be free from smut. The two effective mercurial dusts are the only two in common use on wheat and other seed in Queensland being Agrosan and Ceresan. The choice of either of these or of any reliable brand of copper carbonate rests with the farmer concerned.

Summary.

Sorghum smut has become somewhat prevalent in this State, but it can be controlled by the dust seed treatments which are used for covered smut of wheat.

The Brisbane Exhibition.

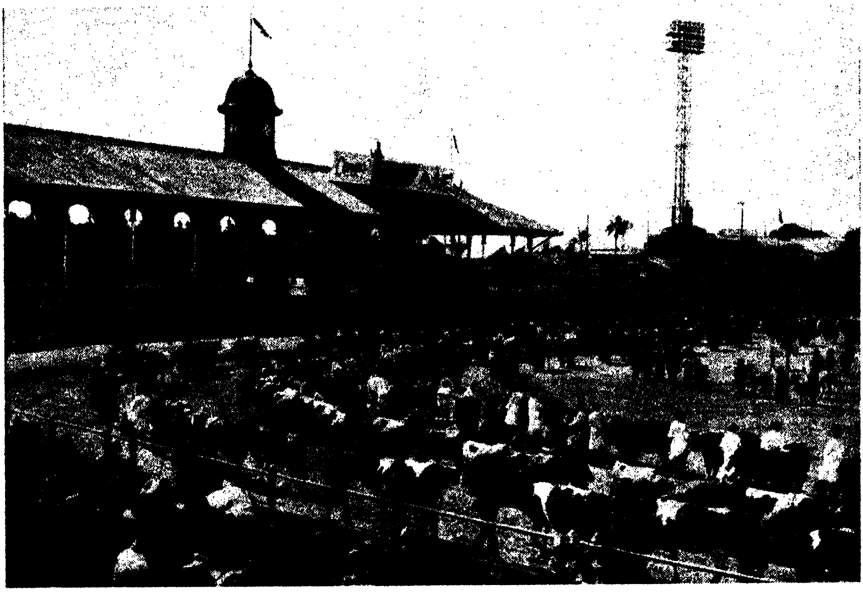


Plate 70.
THE GRAND PARADE.

Plate 71.
ANOTHER SECTION OF BRISBANE'S PICTURESQUE SHOW ARENA.

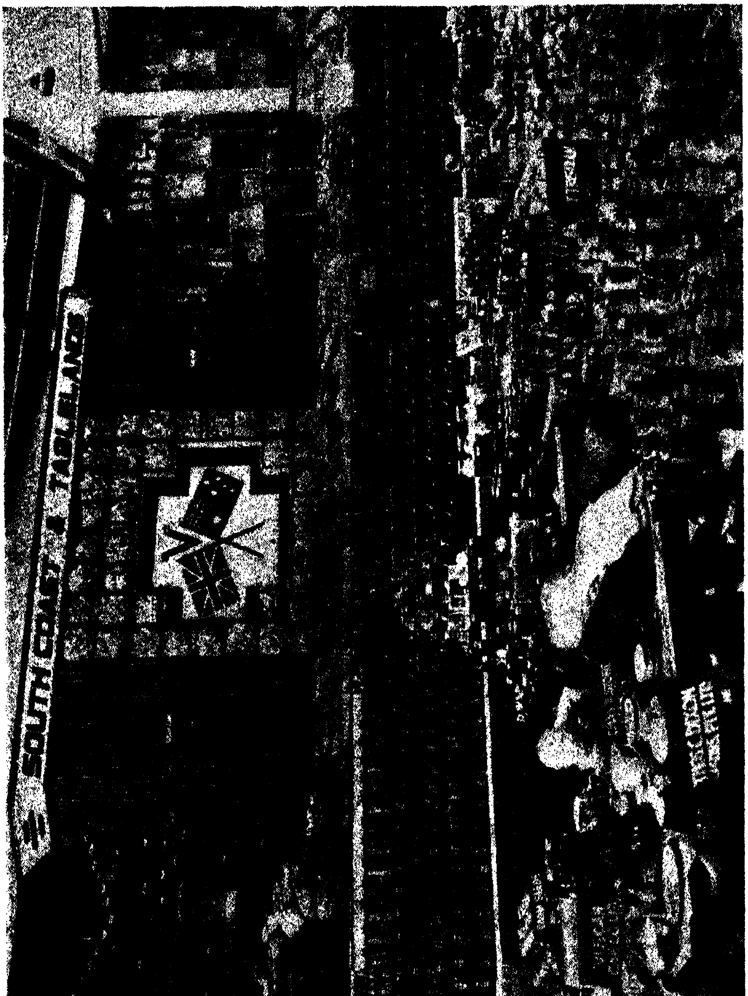


Plate 72.
THE WINNING "A" GRADE DISTRICT EXHIBIT.

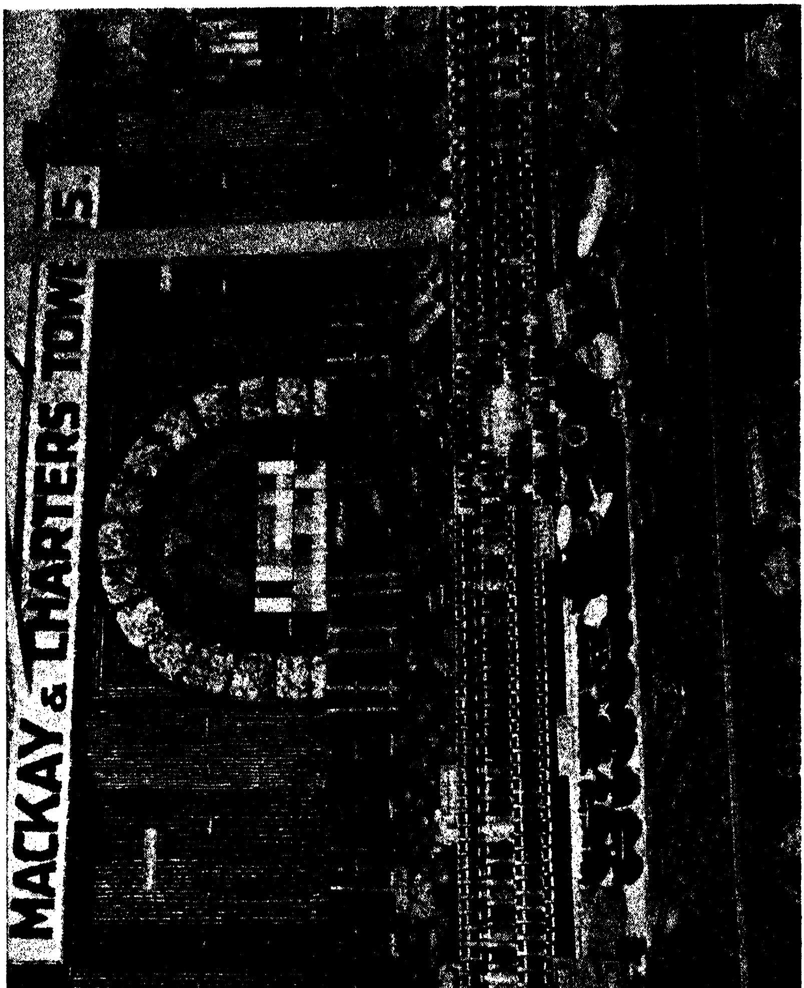


Plate 73.
THE WINNING "B" GRADE DISTRICT EXHIBIT.

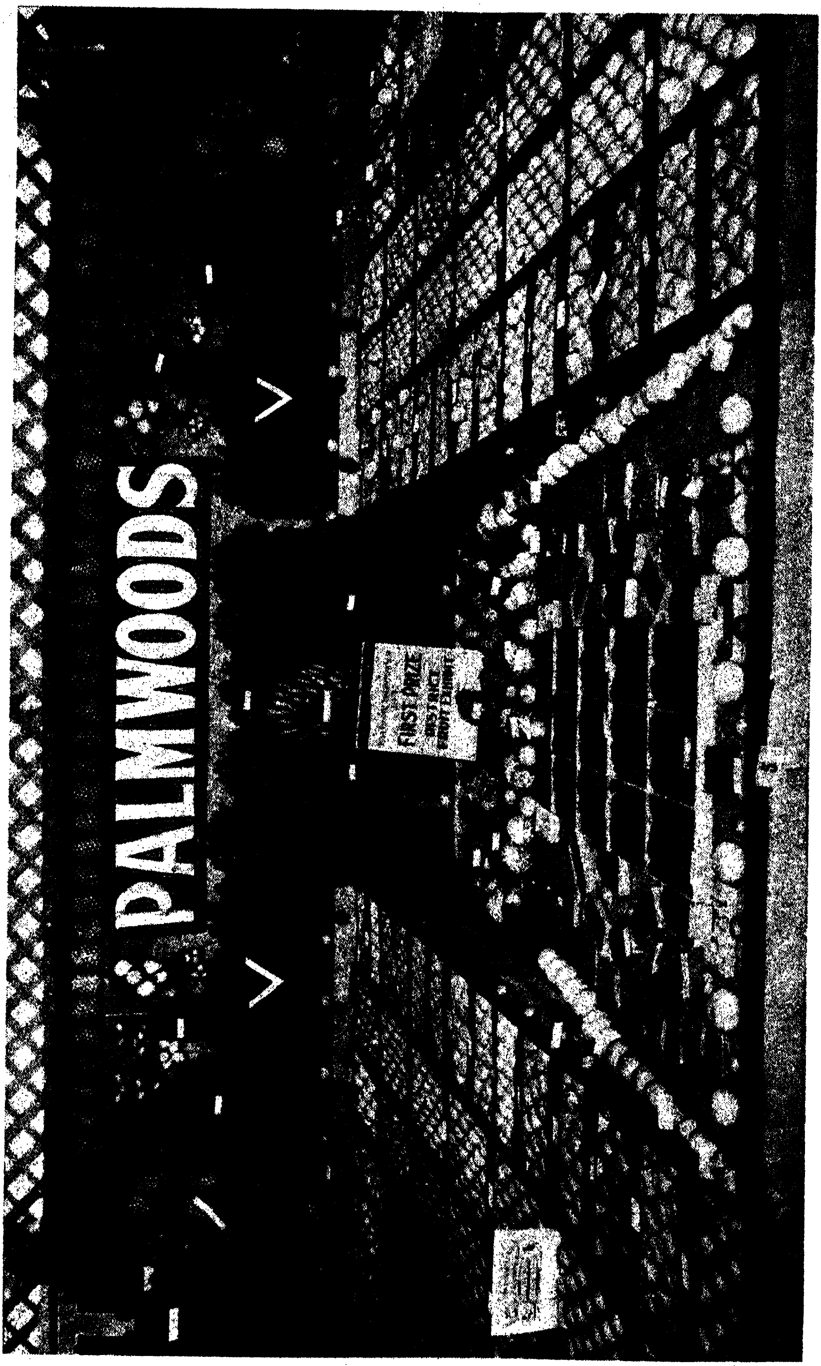


Plate 74.
THE FIRST PRIZE DISTRICT FRUIT EXHIBIT.

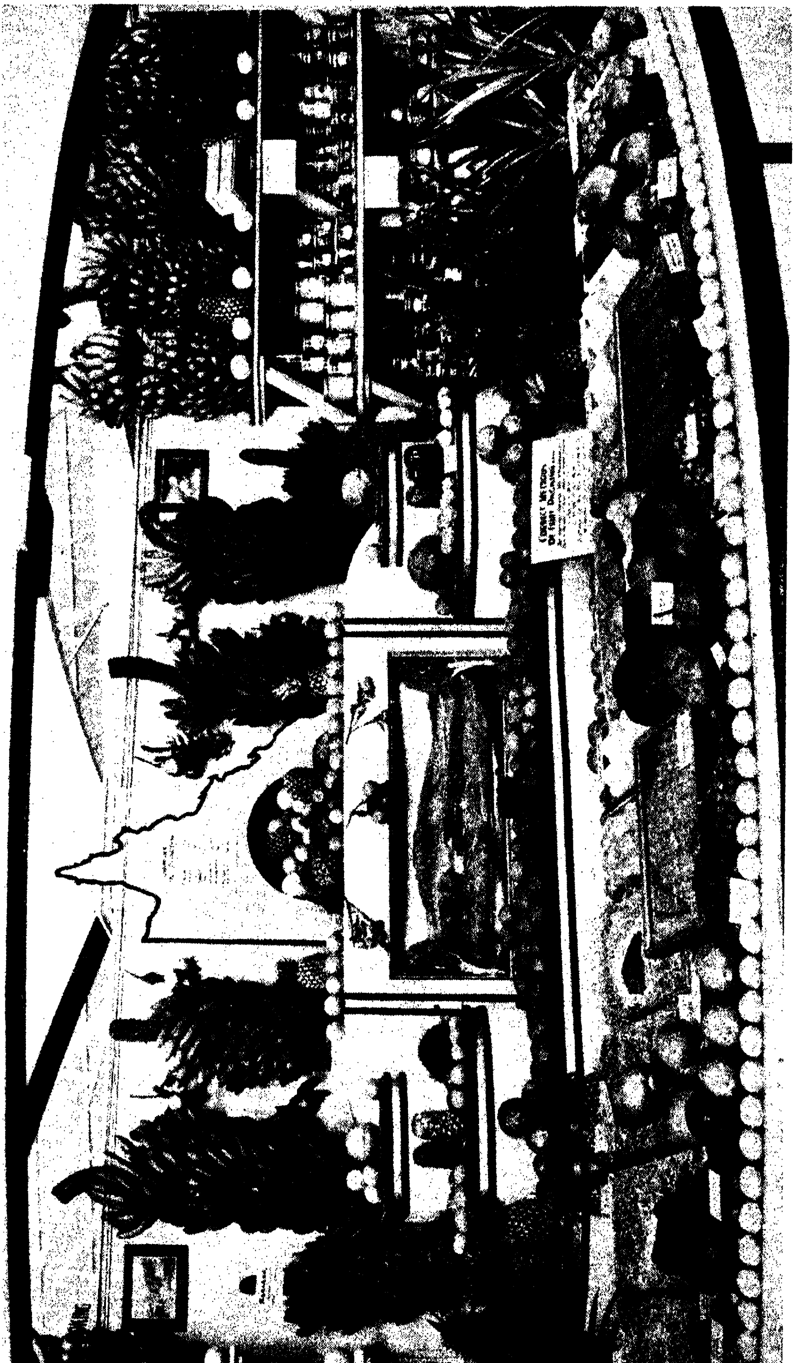


Plate 75.

PRODUCTS OF A FRUITFUL LAND.—This display, arranged by officers of the Fruit Branch of the Department of Agriculture and Stock, illustrated the remarkable range of temperate and tropical fruits for which Queensland is justly renowned.

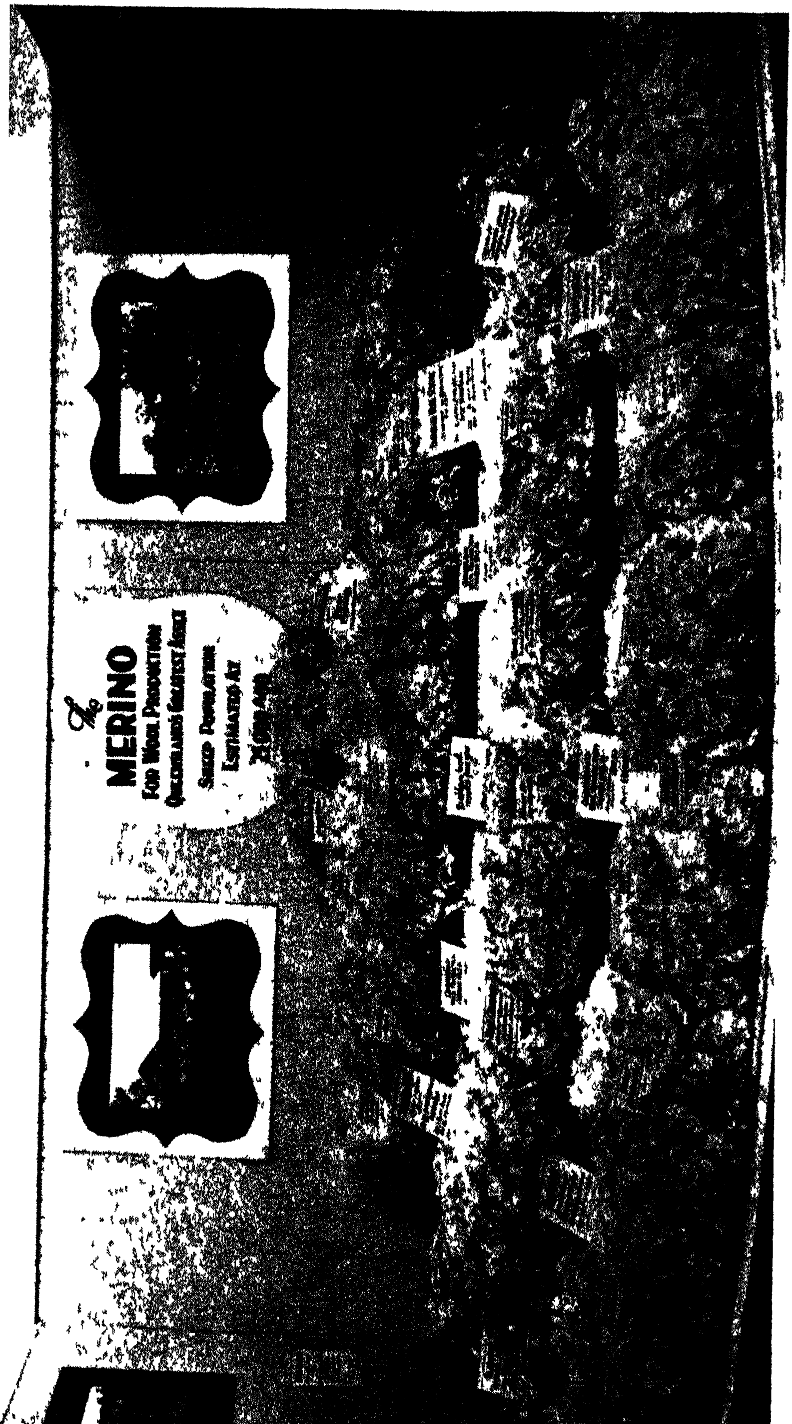


Plate 76.

THE WOOL ALCOVE IN THE COURT OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

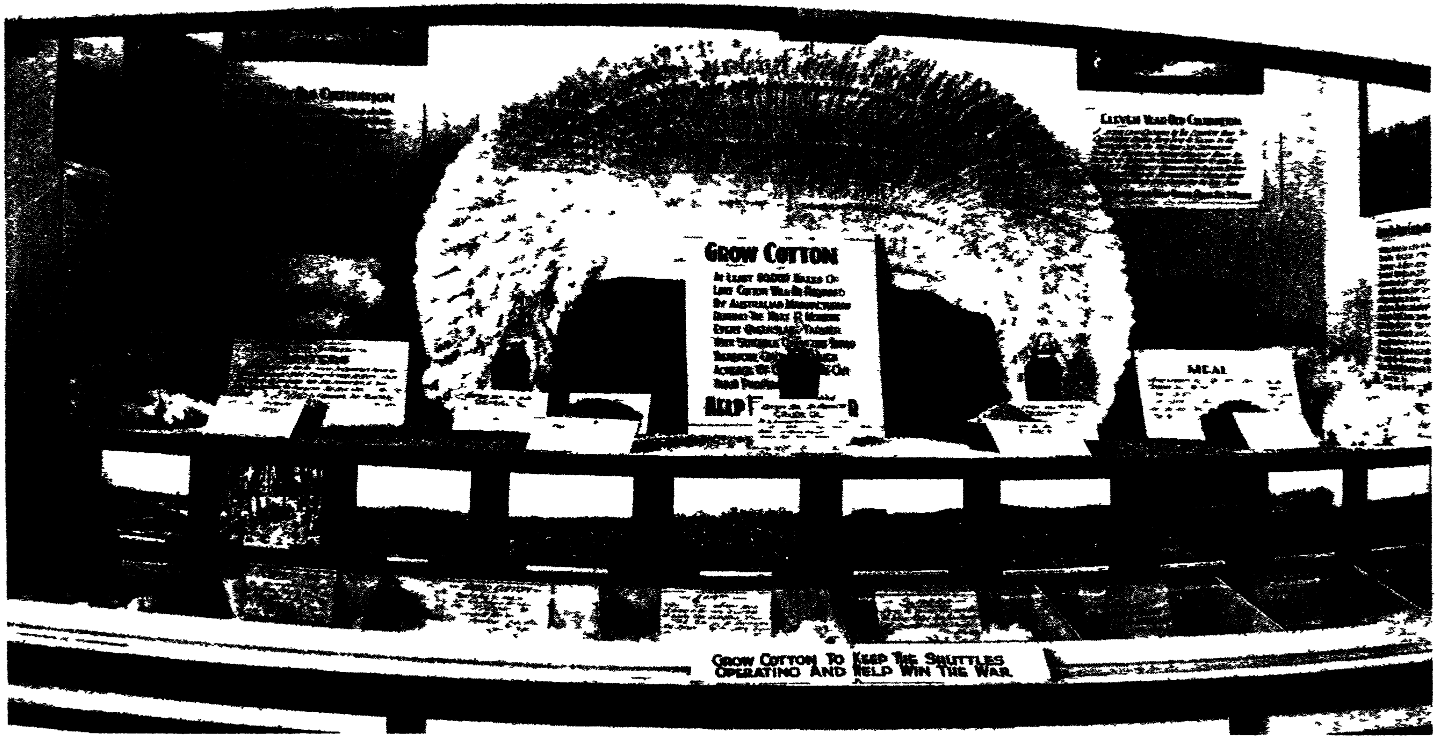


Plate 77.

FROM THE GINNERY TO THE SPINNERY.—Queensland cotton is produced for Australian industry, and this display arranged by officers of the Cotton Branch showed the quality of the home grown fibre and the diversity and value of crop derivatives. For the cotton grower there is a guaranteed market and a guaranteed price. Farmers with suitable land are urged to plant as big a cotton acreage as they can properly cultivate.

Plate 78.

"GADGETS AND WRINKLES" OF SUCCESSFUL DAIRYING.—Popular interest centred on this section of the departmental display in the Court of Agriculture.

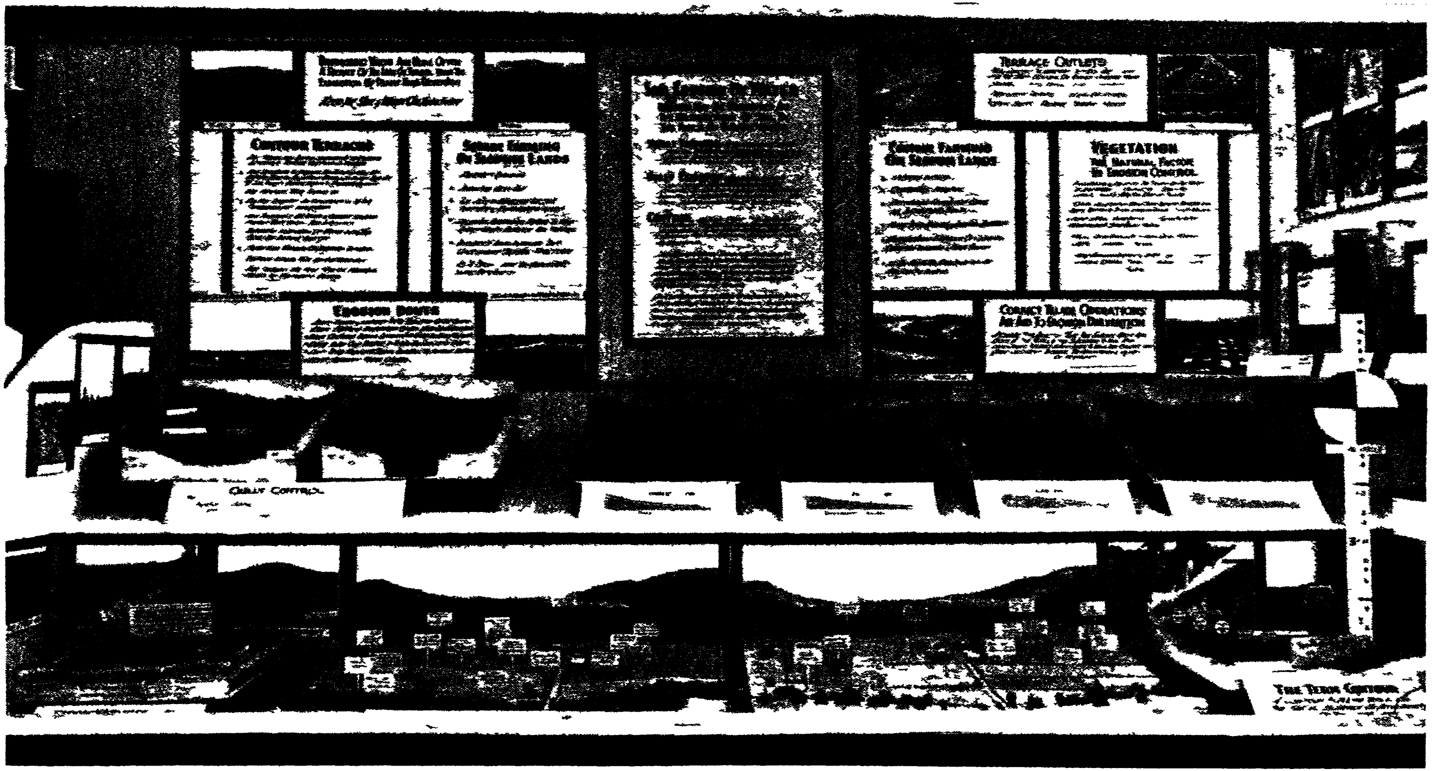


Plate 79

OBJECT LESSONS IN SOUND FARMING PRACTICE.—Methods of soil security—the prevention of the washing of real wealth from ridge to river and the fertility which goes or blows with the wind—were demonstrated with landscape models in this alcove in the Court of the Department of Agriculture and Stock.

Plate 80.

PASTURE GRASSES AND POISONOUS PLANTS IN EDUCATIONAL CONTRAST.

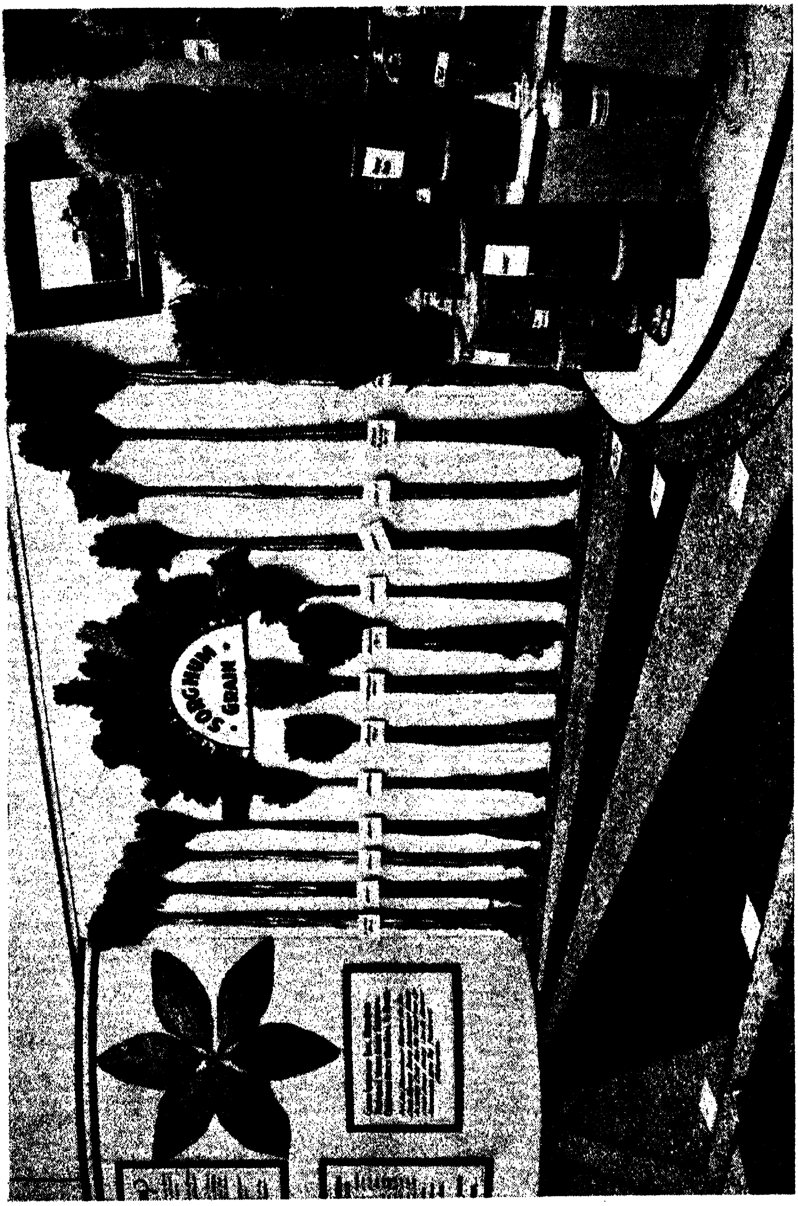


Plate 81.

An Array of Grain Sorghums in the Court of Agriculture.

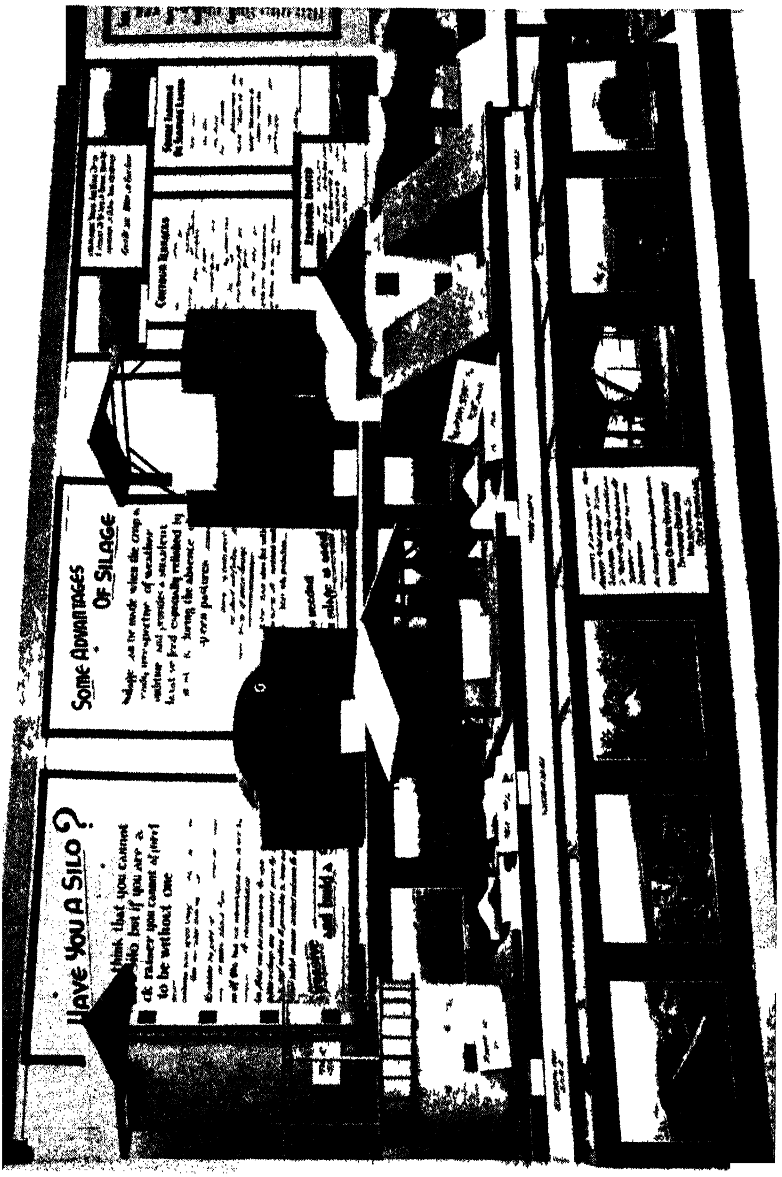


Plate 82.

FODDER CONSERVATION ON THE FARM.—Models of various types of silos built by the Instructional Staff of the Agricultural Branch demonstrated impressively the efficiency and economy of this form of livestock insurance.

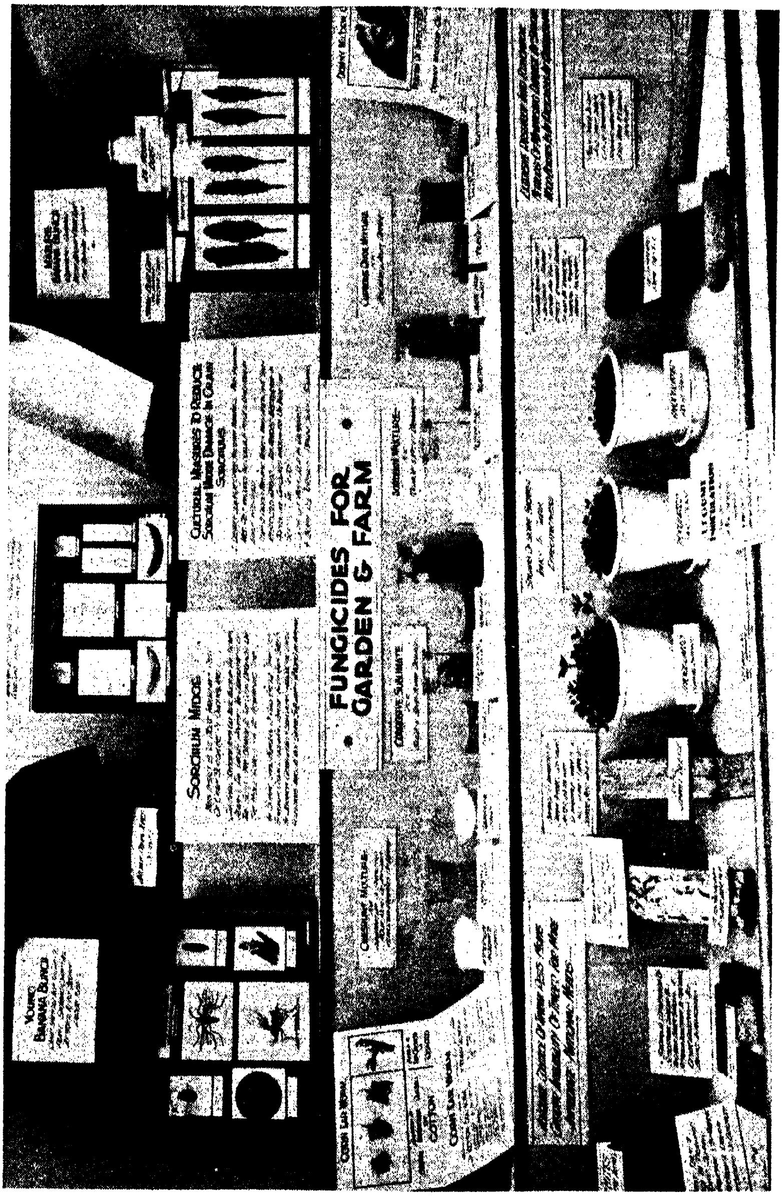


Plate 83.

LINKAGE OF SCIENCE WITH FARM PRACTICE.—Arranged by officers of the Research Division, this display illustrated impressively how pests and diseases of farm crops are effectively controlled.

Plate 84.
THE JOURNAL CORNER.—A well-organised and efficient information service was maintained throughout Exhibition Week.

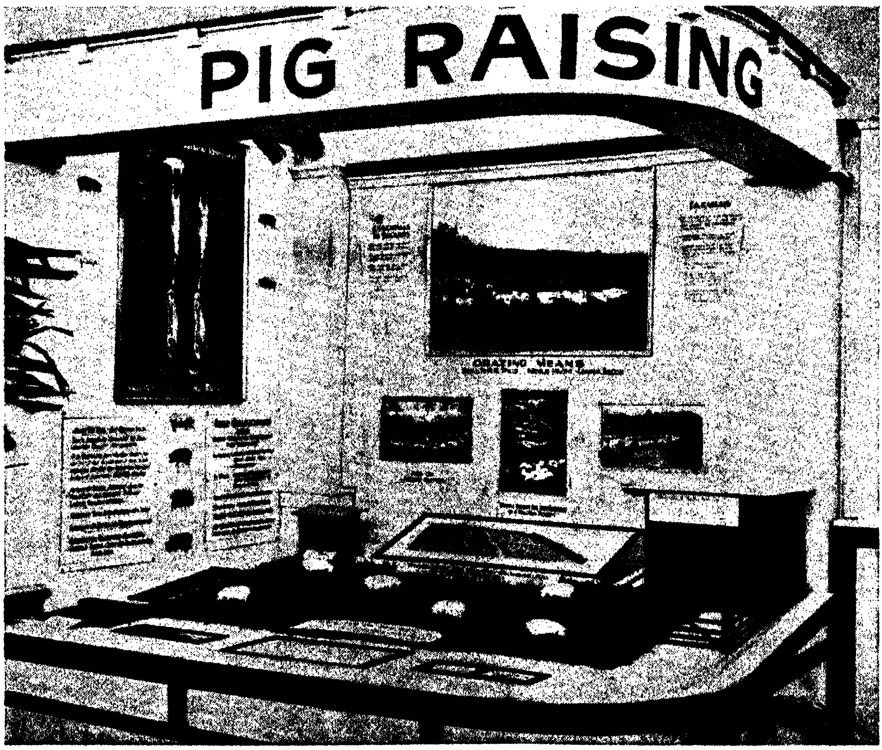


Plate 85.
POINTS IN PIGGERY PRACTICE WERE FITLY DEMONSTRATED IN THIS EXHIBIT.

Plate 86.

THE POULTRY ALCOVE IN THE COURT OF AGRICULTURE.

POINTS IN POULTRY FARMING.

In poultry farming, culling serves two important purposes. By getting rid of the culls, all of the feed goes to the laying hens; and only the best hens remain in the flock to serve as future breeding stock.

Other sound points in poultry farming include care in the handling and marketing of eggs. Eggs are considered to be one of the best of foods, yet in spite of that fact the quantity consumed by Queenslanders (estimated on an annual *per capita* basis) is extraordinarily low. Why more eggs are not eaten is probably because their regular dietary value is not more widely appreciated. There are other reasons, too; for instance, the delivery of dirty-shelled eggs and the production of fertile eggs in hot weather. Clean nests, clean floors, and clean containers will soon overcome the dirt difficulty; while selling off all the male birds at the close of the hatching season is the answer to the other problem. Eggs should be gathered two or three times daily, and marketed at least twice weekly in hot weather.

In looking after poultry, even with the best of care, we often overlook a very common source of trouble, and that is the house fly. Flies can go a long distance and carry germs and contamination from a diseased flock, or from microbe-infested filth. The industrious pullet will chase and catch flies just for the fun of it, and, at the same time, take in all sorts of germs or worms. So it would be wise to clean up every attraction for flies and spray the fowl houses just before cleaning them out. For general health reasons, apart from the requirements of the fowl run, it pays handsomely to swat the fly.

Name and Address.	Name of Hatchery.	Breeds Kept.
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	Australorps
W. Brown, Waterworks road, The Gap, Ashgrove	Strathleven ..	White Leghorns
W. T. Burden, 44 Drayton road, Toowoomba	Harristown ..	White Leghorns, Australorps, and Rhode Island Reds
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca.. ..	White Leghorns and Australorps
W. C. Carlow, Upper Brookfield	Adaville ..	Australorps, White and Brown Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlinton ..	White Leghorns
W. Chataway, Cleveland ..	Wilona ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
Mrs. M. M. Cousner, The Gap, Ashgrove	Progressive Poultry Farm	Australorps and White Leghorns
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, and Rhode Island Reds
O. M. Dart, Brookfield	Woodville ..	White Leghorns, Australorps, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros. ..	White Leghorns
T. Duval, Home Hill	Athalie ..	White Leghorns and Rhode Island Reds
E. Eckert, Head street, Laidley	Laidley ..	Australorps, Langshans, and White Leghorns
Elks and Sudlow, Beerwah ..	Woodlands ..	White Leghorns and Australorps
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner ..	Australorps
F. Farrier, Miller road, Birkdale	Glenwood ..	White Leghorns
B. E. W. Frederich, Oxley road, Corinda	Glenalbyn ..	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
C. and C. E. Gustafson, Tannymorel	Bellevue ..	White Leghorns, Australorps, and Rhode Island Reds

Name and Address.	Name of Hatchery.	Breeds Kept.
F. E. Hills, Sims road, Bundaberg	Littlemore ..	Rhode Island Reds, Australorps, White Wyandottes, White Leghorns, and Langshans
C. Hodges, Kuraby	Kuraby ..	White Leghorns
A. E. Hoopert, 24 Greenwattle street, Toowoomba	Kensington ..	Australorps, Rhode Island Reds, and White Leghorns
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds
Miss K. E. Jenkins, Phillip street, Sandgate	Brooklands ..	Australorps, White and Brown Leghorns
S. W. Kay, Cemetery road, Mackay	Kay's Poultry Stud	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
W. A. Lehfeldt, Kalapa ..	Lehfeldt's ..	Australorps
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps, White Leghorns, and Light Sussex
J. McCulloch, Whites road, Manly	Hinde's Stud Poultry Farm	White and Brown Leghorns and Australorps
W. S. McDonald, Babinda ..	Redbird ..	Rhode Island Reds and Anconas
F. W. McNamara, Vogel road, Brassall, Ipswich	Franmara ..	White Leghorns and Australorps
A. Malvine, junr., Waterworks road, The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White and Black Leghorns
A. E. Mengel, Campbell street, Toowoomba	Glenmore ..	White, Black, and Brown Leg- Leghorns, Anconas, Australorps, and Rhode Island Reds
C. Mengel, New Lindum road, Wynnum West	Mengel's ..	Australorps
J. A. Miller, Charters Towers ..	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	White and Brown Leghorns and Australorps
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor	Ferndale ..	White and Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Coopers Plains	Norups	White Leghorns and Australorps
C. O'Brien, Hugh street, Townsville	Paramount ..	White Leghorns and Rhode Island Reds
H. Obst and Sons, Shepperd ..	Collegeholme ..	White Leghorns and Rhode Island Reds
A. C. Pearce, Marlborough ..	Marlborough ..	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, and Langshans
E. K. Pennefather, Douglas street, Oxley Central	Pennefather's ..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farms	White Wyandottes, White Leghorns, Brown Leghorns, Australorps, Rhode Island Reds, Langshans, and Light Sussex
G. R. Rawson, Upper Mount Gravatt	Rawson's ..	Australorps
J. Richards, P.O., Atherton ..	Mountain View	Leghorns and Australorps
W. G. Robertson, Bilsen road, Nundah	Ellerslie ..	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa Stud Poultry Farm	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds Kept.
W. B. Slawson, Camp Mountain	Kupidabin ..	White Leghorns, Australorps, and Light Sussex
Mrs. A. Smith, Beerwah.. ..	Endcliffe ..	Australorps and White Leghorns
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Australorps
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. G. Teitzel, West street, Aitkenvale, Townsville	Teitzel's ..	White Leghorns and Australorps
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns and Australorps,
P. and K. Walsh, Pinklands, via Cleveland	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's ..	Australorps, White and Brown Leghorns, Anconas, Minorcas, Rhode Island Reds, Indian Game, and Bantams
H. M. Witty, Boundary road, Kuraby	Witty's ..	White Leghorns
P. A. Wright, Laidley	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps

USES FOR OLD MOTOR TUBES.

Many uses can be found for a strip of rubber from an old motor tube.

The hands are apt to get sore when digging, hoeing, and doing many other jobs which call for constant friction. Cut two pieces of the rubber as shown in the sketch, so that they will slip over and protect the fingers and palms, while being held in place by the loops formed to grip the back of the hands.

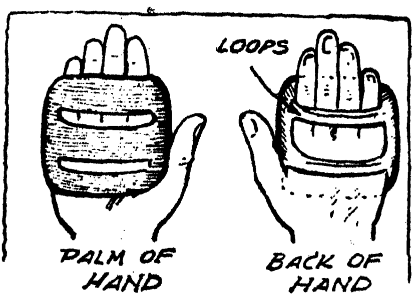
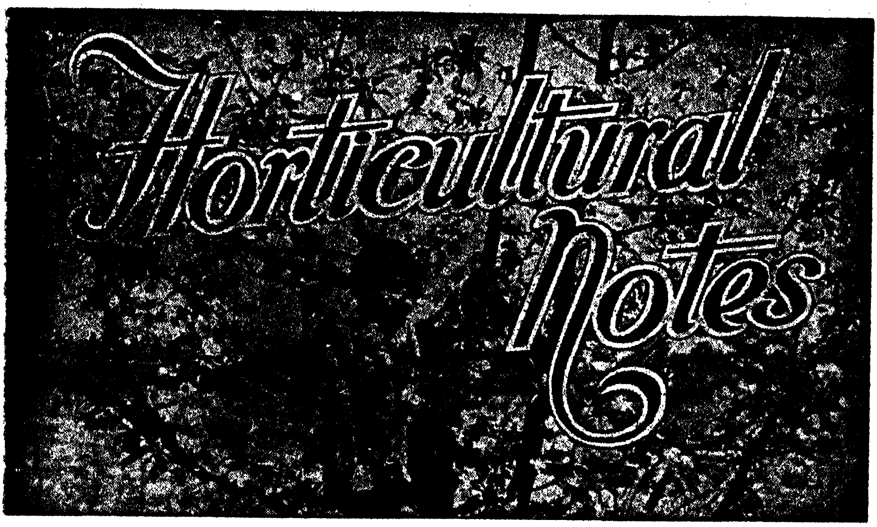


Plate 87.

Rings cut from a tube, slipped over the feet and up the legs keep the trouser bottoms from coming into contact with wet soil much more comfortably than the usual piece of string.

A number of strips twisted together and nailed to gate and post will act as a very efficient spring to keep the gate closed.

Two or three bands carried in the pockets will come in handy in a hundred odd ways when you are working about the garden, taking the place of string, wire, and nails in many places.



Packing Sheds and Equipment.

IN many deciduous fruit districts marketing activities are now at a minimum, and it is possible to overhaul, repair, replace, and add to the existing packing-shed equipment. Many growers carry on, season after season, with makeshift equipment, when, for a little time and a small expenditure of money, a properly-equipped packing shed could be furnished.

Packing stands, nailing-down presses and benches, sizing-machines, hammers, stencils, and other equipment should all be gone over and restored to a high state of efficiency. Simple designs for packing stands, nailing-down presses, and case-making benches can be procured, and are not hard to follow by anyone who is useful with a hammer and saw. Simple forms of sizing-machines can also be made at home, while those growers who have commercial machines should overhaul them thoroughly, tightening up all screws and bearings, and, if necessary, renewing the padding in the bins and feed channels. Broken parts should be replaced, and power plants overhauled. Broken handles in working tools should be renewed. Case end scrapers and packing needles should be sharpened and greased and packed away until required next season.

Complete sets of new stencils can be cut. A sheet of thin zinc, a small chisel, round and flat fine-grain files, a hammer, and a piece of end-grain hardwood are the necessary tools. The designs of the letters to be cut can easily be made by obtaining stencils, and copying them on to the zinc in the design wanted. The stencilled letters are then cut out of the sheet of zinc with hammer and chisel, and, in that way, an excellent stencil is made. Stencils are easily obtained, and there is no need to use blue crayon for marking cases.

When the overhauling of plant has been completed, growers should turn their attention to the cleanliness of the packing shed. Old cases and picking-boxes should be repaired or burned, a close inspection of the cracks and crevices being made for pupating insects, such as codling moths. Any shed-stored fruit which has rotted in the cases should be removed and destroyed and the cases thoroughly sterilized by completely immersing them in a 5 per cent. solution of formalin for at least one minute. Floors and other parts of the building affected by juice from rotted fruit should also be treated.

Close attention to these details will enable growers to make a clear start at the next harvesting period.

SELECTING THE DEEP SUCKER IN BANANA CULTURE.

At this period of the year banana plantations are making a flush of suckers. On the selection of the best sucker on each plant will depend the success of the following crop and the future life of the plantation.

The corm of a banana plant produces at least two rings of buds which, at growing periods, burst into growth. Of these, the top circle is about 2 inches from soil level and the lower circle is usually 2 or 3 inches below the top circle. Suckers from any of these buds do not send forth the correct follower.

At the base of the corm a bud is produced which bursts into growth at a particular stage in the life of the parent plant. From plantation trials extending over several years, it has been found that the parent plant sends out the correct follower sucker when it has made three-quarters of its growth.

The maturity of a banana plant is governed not by the time it is in the soil but by the nature of the conditions during its growth. The deep follower produced at the right stage by the parent plant has more vitality, and its roots are deeper, and it retains its sword leaves longer. The shallow follower, on the contrary, develops its mature foliage early and the corm rises above soil level, thereby preventing the effective functioning of its higher roots.

The careful digging out of a three-quarter mature plant will reveal the habit of sucker formation, both shallow and deep. If suckers are planted with the side of severance down-hill, the general experience is that the correct follower will invariably appear just where it is wanted—i.e., up-hill.

CULTIVATING NEW BANANA LAND.

The benefit to be derived from a through breaking-up of the soil in new land should not be overlooked, especially as so much forest country is now being used for banana-growing. If possible, breaking-up should be done before planting, but, with new land, time may not permit of this being done between burning-off and planting. Therefore, growers are advised to do this work during the first winter at the very latest, otherwise much damage may be done to the rooting system of the banana plants. Mattocks or fork hoes are the implements best suited for this work.

The land should be dug up to a depth of not less than 8 inches. A great improvement in the physical and mechanical condition of the soil will be observed soon afterwards. Increased root development, making possible the drawing of plant food from a much greater area, will result in vigorous plant growth and the production of larger bunches and fruit of higher grade.

On many farms, small crops, such as peas and beans, are planted between the rows of young bananas, and the thorough breaking-up of the soil will also benefit these crops, inducing quicker growth and greater bearing capacity.

The need for improving the humus content of the soil, particularly our forest soils, should be recognised. Humus can be added to the soil by burying the pea and bean plants after the pods have been picked. Shallow trenches should be dug across the slope of the land at convenient intervals, and the crop residues buried in the trenches under a covering of at least 2 inches of soil. The formation of these trenches across the slopes assists in preventing surface soil erosion.

Legumes such as beans and peas extract nitrogen from the air, and some of this nitrogen is returned to the soil in a readily available form when the roots and vines of these plants are turned under. The soil is thus enriched with this valuable plant-food. In addition, the humus content, fertility, and moisture-retaining capacity—a very important factor in successful banana-growing—of the soil is increased or, at least, maintained.

Where the soil has been well dug, less chipping is required, because the rapid growth of the banana plant soon controls weed growth; besides, mechanical condition of the soil is improved, making chipping easier and thus reducing cultivation and production costs.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

DRY weather conditions still continue in most fruit and vegetable districts, to the detriment of fruit and vegetable supplies. Growers are still urged to keep up the maturity of all fruits during the colder months, particularly to southern markets where the ripening of tropical fruits is not assisted by their winter conditions. Fruit at present should be carefully packed to a colour standard. These conditions will, of course, alter as the season advances into October, when care will need to be exercised in selecting less advanced fruit.

Prices during the last week of August were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Smalls, 5s. to 9s.; Sixes, 7s. to 11s.; Sevens, 8s. to 13s.; Eights, 10s. to 14s.; Nines to 15s.

Sydney.—Cavendish: Sixes, 8s. to 12s.; Sevens, 9s. to 15s.; Eights and Nines, 12s. to 16s.

Melbourne.—Cavendish: Sixes, 9s. to 13s.; Sevens, 11s. to 15s.; Eights and Nines, 13s. to 16s.

Adelaide.—Cavendish: 12s. to 18s. per case. Some lines showing squirter.

Brisbane.—Sugars, 1d. to 4d. dozen. Inferior lines lower. Lady Fingers, 2d. to 9d. per dozen.

Pineapples.

Brisbane.—Smooths, 3s. to 6s. case; 1s. to 5s. dozen. Roughs, 4s. to 6s. case; 1s. to 5s. dozen.

Melbourne.—Smooths, 8s. to 12s. per case. Black heart prevalent.

Adelaide.—Smooths, 12s. to 15s. per case.

Custard Apples.

The season for this fruit is now at an end. Prices throughout the year have maintained high levels.

Papaws.

Brisbane.—Locals, 2s. to 4s. 6d.; Yarwun, 5s. to 7s. tropical case; Gunalda, 3s. 6d. to 4s. 6d. bushel.

Sydney.—6s. to 10s. Some lines still arriving on the green side.

Melbourne.—8s. to 10s.; well coloured lines to 12s.

CITRUS FRUITS.

Oranges.

Brisbane.—Commons, 5s. to 8s.; Navels, 6s. to 9s.

Sydney.—Navels to 10s.

Melbourne.—Navels, 6s. to 12s.

Mandarins.

Brisbane.—Emperors, 8s. to 15s.; Scarlets, 10s. to 18s.; King of Siam, 9s. to 13s.

Sydney.—Emperors, 8s. to 11s.

Melbourne.—Emperors and Scarlets, 7s. to 14s.

Lemons.

Brisbane.—5s. to 11s.

Sydney.—8s. to 10s.; specials higher.

Melbourne.—7s. to 10s.; specials higher.

Grapefruit.

Brisbane.—4s. to 7s.

Sydney.—7s. to 11s.

Melbourne.—7s. to 12s.

OTHER FRUITS.

Avocados.

Brisbane.—8s. to 10s.

Strawberries.

Brisbane.—4s. to 9s. dozen. Many lines affected by rain.

Sydney.—9s. to 12s. 6d. dozen; trays, 2s. 6d. to 6s. Many lines affected by rain.

Passion Fruit.

Brisbane.—First grade, 8s. to 11s. half-bushel; Seconds, 5s. to 7s.

Tomatoes.

Brisbane.—Coloured, small, 4s. to 7s.; others, 8s. to 11s.; Ripe, 4s. to 8s.; Green—Locals, 3s. to 6s.; Northern, 4s. to 9s.

Sydney.—South Queensland: Special Coloured, 10s. to 13s.; Others, 6s. to 10s.; Bowen, 4s. to 10s.; specials higher.

Melbourne.—Queensland, 6s. to 8s. for repacks; West Australia, 5s. to 10s. half-bushel; Adelaide, 14s. to 17s. half-bushel.

VEGETABLES.

(Brisbane prices only, unless otherwise stated.)

Beans.—Brisbane, 18s. to 25s. bag; inferior lower; Sydney, 12s. to 22s. bushel. Many inferior lines noted. These will assist in creating poor prices. Melbourne, 10d. to 1s. 2d. lb.

Peas.—Brisbane, 18s. to 22s. bag—values eased at week-end to 12s. to 15s.; inferior lower; Melbourne, 6d. to 9d. lb.

Cauliflower.—Small, 2s. to 4s. dozen; good lines, 6s. to 10s.; Stanthorpe, 10s. to 14s. chaff bag.

Cabbage.—6s. to 12s. dozen; specials higher.

Carrots.—6d. to 1s. 6d. bundle.

Beetroot.—6d. to 1s. 6d. bundle.

English Potatoes.—2s. 6d. to 5s. sugar bag.

Sweet Potatoes.—2s. to 3s. 6d. sugar bag.

Rhubarb.—1s. to 1s. 6d. bundle.

Marrows.—2s. to 5s. dozen; Sydney, 8s. to 10s. per case.

Pumpkins.— 5s. to 6s. 6d. bag.

Lettuce.—9d. to 3s. 6d. dozen.

VALUE OF LIQUID MANURE.

Value of the liquid manure from a herd of forty dairy cows would, in twenty-five weeks, reach a total of £50, or 25s. per cow, if fully conserved (says a Scottish investigator). Three and a-half tons of potash salts—now almost unobtainable—two and a-half tons of sulphate of ammonia, and a-half ton of superphosphate is estimated to be needed to make a dressing of artificials of equal manurial value. This is one of the reasons why every effort should be taken to see that liquid manure is used to the full on every farm.

General Notes

Staff Changes and Appointments.

The following officers of the Department of Agriculture and Stock have been appointed Local Supply Officers for the purposes of the "National Security (Emergency Supplies) Rules of 1941" at the centres mentioned:—Messrs. S. E. Stephens (Instructor in Fruit Culture), Cairns; C. C. Barth (District Inspector of Stock), Townsville; S. C. Smith (Inspector of Stock), Mackay; and L. J. C. Mullen (Fauna Protector), Rockhampton.

Mr. A. James, loader for the Committee of Direction of Fruit Marketing at Howard, has been appointed also an Inspector under *The Diseases in Plants Acts* in place of Mr. J. F. Whitby, resigned.

Messrs. F. P. Walsh and R. H. Sanders, of Eagle Heights, have been appointed honorary rangers under *The Native Plants Protection Act* and honorary protectors of fauna.

Mr. J. Shilkin, veterinary surgeon (milk investigation), has been appointed also an inspector under *The Diseases in Stock and Dairy Produce Acts.*

Miss M. E. B. Power has been appointed an assistant cane tester for the current sugar season at Moreton Mill, Nambour, in place of Mr. A. Byrne, resigned.

Mr. W. D. Scott (Green Island) has been appointed an honorary ranger under *The Native Plants Protection Act* and honorary protector of fauna.

Mr. J. W. McMullen (Rockhampton) has been appointed an honorary protector of fauna.

Constables F. S. Tapsall (Cooroy) and D. Chapman (Malbon) have been appointed also inspectors under *The Slaughtering Act.*

Avocado Levy and Extension of Pineapple Levy.

A Regulation has been issued under *The Fruit Marketing Organisation Acts* empowering the Committee of Direction of Fruit Marketing to make a levy on all avocados marketed from 15th July, 1941, at the following rate:—

(1) On all avocados sold, consigned, or delivered by rail to any agent, person, firm, company, or corporation in Queensland at the rate of 3s. 4d. per ton with a minimum of 1d.;

(2) On all avocados sold, consigned, or delivered otherwise than by rail to any Queensland railway station to any agent, person, firm, company, or corporation at the rate of 1d. per case.

An amendment of this Regulation has also been approved, and this provides that the levy shall be at the rate of 6s. 8d. per ton instead of 3s. 4d. per ton.

A further Regulation has been issued under the abovementioned Acts extending the Pineapple Levy Regulation, which came into operation in August, 1940, for a further period from 25th August, 1941, to 31st December, 1941. For the period of the extension, the Committee of Direction has reduced the levy on fresh pineapples from 2d. to 1d. per case.

Fauna Sanctuary.

An Order in Council, issued under *The Fauna Protection Act of* 1937, declares the property of Mr. A. H. Wheatley, "Happy Days," at Mission Beach, via Tully, to be a sanctuary for the protection of fauna. Mr. Wheatley has been appointed an honorary protector for the sanctuary.

Fruit Marketing Organisation Acts.

Regulations have been issued under *The Fruit Marketing Organisation Acts* constituting the electorates for the purpose of electing members of the various sectional group committees. These include the banana, pineapple, citrus, deciduous, and other fruits sectional group committees.

Herbert River Cane Levy.

A regulation has been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Herbert River District Cane Growers' Executive to make a further general levy for administrative purposes on suppliers of sugar-cane to the Macknade and Victoria mills at the rate of ½d. per ton.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production records for which were compiled during the month of July, 1941 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Alfa Vale Model 2nd (328 days)	W. H. Thompson, "Alfa Vale," Nanango	18,529·8	903·901	Reward of Fairfield
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Ventnor Mab	C. W. Black, "Ventnor," Kumbia	7,876·78	342·419	Kyabram Twiney Boy
Newhaven May (235 days)	E. O. Jeynes, "Newhaven," Raceview	6,132·0	282·121	Croyden Magnet
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Merrivale Buttercup 9th (257 days)	W. Soley, Malanda	8,086·35	250·190	Greyleigh Honorarium
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Carn Brea Sunrise	A. T. Paull, Bowenville	6,274·94	296·730	Laguna Emblem
Murray Bridge Pansy 2nd (250 days)	A. T. Paull, Bowenville	5,379·75	255·955	Murray Bridge De Valera
Carn Brea Angel	A. T. Paull, Bowenville	6,021·3	251·403	Laguna Emblem
Parkview Fussy 67th (243 days) (Died)	J. Crookey, Allora	5,695·05	245·585	Parkview Radiant
Merrivale Bonnie 7th	W. Soley, Malanda	7,713·75	243·719	Greyleigh Gleaner
Murray Bridge Nancy	A. T. Paull, Bowenville	5,334·76	236·316	Murray Bridge De Valera
	JERSEY.			
	MATURE COW (STANDARD, 350 LB.).			
Vanette of Linwood	F. W. Kath, Moffatt, *via* Dalby	9,155·23	550·785	Aerofoil of Banyule
Kathleigh Lady	F. W. Kath, Moffatt, *via* Dalby	9,396·35	528·473	Retford King's Thorn
Kathleigh Promise	F. W. Kath, Moffatt, *via* Dalby	9,544·07	523·269	Retford Royal Atavist
Pride of Linwood (365 days)	C. W. Barlow, Irvingdale road, Dalby	8,639·3	491·304	Listowel Royal Heir
Langside Prim	S. H. Caldwell, Walker's Creek, Bell	9,084·04	466·585	Masterpiece Yeribee of Brucevale
Kathleigh Faith	F. W. Kath, Moffatt, *via* Dalby	8,369·52	464·546	Retford Royal Atavist
Trinity Lady Hopeful	J. Sinnamon and Sons, Moggill	6,888·13	366·359	Somehope (Imp.)

	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Kathleigh Ettie	**F. W. Kath, Moffatt, *via* Dalby**	8,961·48	511·494	**Retford King's Thorn**
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
Inverlaw Golden Belle	R. J. Crawford, Inverlaw, *via* Kingaroy	8,173·02	456·880	Oxford Royal Lad
Inverlaw Patsy	R. J. Crawford, Inverlaw, *via* Kingaroy	8,221·73	456·159	Oxford Royal Lad
Kathleigh Beauty	F. W. Kath, Moffatt, *via* Dalby	8,500·26	450·354	Retford King's Thorn
Inverlaw Mabel	R. J. Crawford, Inverlaw, *via* Kingaroy	8,906·02	442·159	Oxford Royal Lad
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Inverlaw Phyllis	R. J. Crawford, Inverlaw, *via* Kingaroy	11,081·25	616·969	Oxford Royal Lad
Inverlaw Lady Cynthia	R. J. Crawford, Inverlaw, *via* Kingaroy	8,648·86	503·904	Carnation Buttercup 2nd's Prince 2nd
Kathleigh Mabel	F. W. Kath, Moffatt, *via* Dalby	7,662·25	405·897	Kathleigh Royal Flyer
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Gem Mabel	W. Bishop, Kenmore	8,436·77	422·92	Laces Volunteer of Ardroy
Rosedale Moolabin Mist 3rd	L. Sheehan, Innis Park, Bundaberg	5,465·41	302·590	Carnation Queens Duke
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Strathdean Favourite	S. H. Caldwell, Walker's Creek, Bell	5,813·25	378·346	Langside Noble Dreamer
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Kathleigh Daffodil	F. W. Kath, Moffatt, *via* Dalby	7,656·45	418·521	Retford King's Thorn
Erceldene Pretty Lass	C. W. Barlow, Irvingdale road, *via* Dalby	5,148·54	272·928	Navua Bontillcere's Lad
Holmsdale Cora	J. Cummings, Nerang	5,093·75	256·806	Richmond Thor
Fauvic Firefly	H. Cochrane, Fauvic, Kin Kin	4,887·4	249·98	Fauvic Nightlight
Trinity Handsome Belle	J. Sinnamon and Sons, Moggill	4,931·53	244·06	Trinity Cute Prince 3rd
Lermont Fancy	P. H. Schull, "Woodview," Oakey	4,472·35	237·934	Hillgrove Maurice

Farm Notes

OCTOBER.

CULTIVATORS or scufflers should be kept moving through early-sown row crops to keep down weeds and maintain a surface mulch, for rain falling on a caked surface soil may not penetrate to any great depth. To check losses of soil during summer storms, all row crops should be sown at right angles to or athwart the prevailing slope.

Sowings of maize, sweet sorghums, grain sorghums, sudan grass, millet, cowpea, peanuts, pumpkins, melons, may be continued and sweet potatoes planted out.

On the western Downs and Maranoa, farmers are advised to sow Sudan grass, which has proved itself in recent years as a summer crop, whether for grazing, hay, or silage.

As a summer-growing fodder plant rich in protein, which can be grazed, or converted into hay or silage (in combination with maize or sorghum) cowpea should be considered. Suitable varieties are black, Poona, and groit. October is a good month for the establishment of summer grasses, chiefly paspalum and Rhodes. Paspalum may be broadcast on scrub "burns," or ploughed land of reasonably high fertility, at the rate of 8-12 lb. seed to the acre, adding white clover seed at the rate of 2 lb. to the acre. Rhodes grass, which is preferred in districts too dry to support paspalum, may be sown from October to January, the ashes left after the burning of timber on scrub land providing an excellent seedbed. No useful results are obtained by broadcasting Rhodes or other grasses on uncultivated land other than a scrub "burn." From 4 to 6 lb. of tested seed to the acre usually provides a good stand.

Where wheat crops are being converted into hay, these should be cut a few days after the flowering stage as they then contain the maximum nutritive value, the nutriment at that stage being spread evenly throughout the plant. A greater tonnage can be obtained by cutting at a later stage, but only at the expense of feeding value and colour.

As harvesting becomes general during November, all necessary machinery should be given a complete overhaul, in order to avoid stoppages at a critical period.

WOMEN ON THE LAND IN WAR TIME.

In these days, women on the land in war-time Britain have a hard row to hoe in more senses than one. Farm work demands skill and knowledge, and is often so heavy that the British farmer has been doubtful about taking on women as farm workers. However, there are about 10,000 girls of the British Land Army now taking the place of men on farms, and they have proved their value. They are generally employed in specialised branches—poultry, dairy, young stock, fruit and market gardening—but a tour of the British countryside showed them handling many heavier jobs—cranking a tractor, "scruffing" calves, and other jobs calling for strength, and they were doing them automatically as if physique counted for nothing. And, more than that, they are taking real war risks without turning a hair. One now famous area in East Kent was being sprayed with shrapnel with tractors well within what the gunner calls the "cone of dispersion." None of the girls driving the tractors asked for a transfer. Instead, they applied for tin hats—and got them—and went on ploughing.

Women in the British villages are saving cargo space by making jam. The country women's associations are all busy on the job. Jam-making centres have been set up in village halls, in empty garages, sometimes in farm kitchens, and every woman lends a hand picking, preparing the fruit, and making jam. Reckoning the average British family now eats 3 lb. of jam a week, these village women, during six months, made enough jam to supply, roughly, 250,000 families for a year.

There is no doubt that one of Britain's greatest assets is her genius for improvisation—doing the unexpected in the unusual way, so to speak. Centuries of freedom have accustomed our women to think for themselves, and from amidst all the destruction and confusion of war they are taking their full share of the national responsibilities. No doubt, the fine attributes of the feminine mind, the eye for detail, and dislike for waste, are proving of value beyond estimate in doing the nation's housekeeping from day to day.

Orchard Notes

OCTOBER.

THE COASTAL DISTRICTS.

OCTOBER is usually a dry month over the greater part of Queensland; consequently the advice given in the notes for August and September on the necessity of thorough cultivation to retain moisture is again emphasised. Thorough cultivation of all orchards, vineyards, and plantations is imperative if the weather is dry, as the surface soil must be kept in a state of soil mulch.

All newly-planted trees should be watched carefully; if they show the slightest sign of scale or other pests they should receive attention at once.

Bananas.

In the warmer districts, banana planting may be continued. All winter trash should be removed and the stools cleaned up. If not already done before the winter, young plantations planted in the previous season should be desuckered without delay. Plants desuckered last autumn should be gone over again, and old plantations also should receive attention. Grow to each stool the number of stems which experience proves to be permissible, but only allow each stem to grow a single follower. Borers will be active again soon, and trapping should be intensified towards the end of the month and supplies of paris green and flour (one part to six by weight) made up in readiness. Caterpillar and grasshopper plagues often occur from the end of the month onwards, and it is wise to lay in a supply of arsenic pentoxide for use in the preparation of bran baits. Watch the plantation carefully for bunchy top, and kerosene and destroy any affected plants without delay. The season of vigorous growth is now commencing, and it will pay well in more and better fruit and in stronger suckers for the next crop to apply a dressing of a complete fertilizer to each stool. Cultivate well to retain moisture, aerate the soil, and kill weeds before they seed. This will also prepare the soil for the planting next month of a green cover crop (such as *Crotalaria goreensis*, thus shading the soil, preventing erosion on slopes, and enriching the soil with nitrogen and humus.

Clean out all banana refuse from the packing shed, and resolve not to allow it to accumulate in future. This will reduce the risk of the development of many fungus rots in the packed fruit.

Pineapples.

From now onwards pineapples may be planted in most districts. Plough thoroughly, remembering always that in the life of a plantation there will be several seasons during which it will be neither possible nor desirable to do more than disturb the surface layer. Obtain advice from the Department of Agriculture and Stock as to whether the soil is sufficiently acid, and, if not, how much sulphur to apply. Care should be taken in the layout of the rows to save time and labour in cultivation and harvesting, and minimise erosion. Select planting material with discrimination from healthy and vigorous plants of a good bearing type. Beware of planting "collars of slips." Always strip off the base leaves and dry in the sun for a few days, and plant shallow. As soon as the roots form, apply 3 cwt. of 10-6-10 fertilizer to the acre. All established plantations are due for their spring fertilizer at the rate of not less than 5 cwt. to the acre. Keep down weeds with a dutch hoe, but do not disturb the soil deeply, always remembering that the pineapple is shallow-rooted and receives a sharp setback if the roots are cut or disturbed with horse-drawn implements. Clean out all pineapple refuse from the packing shed and surroundings, and thus prevent much fungus trouble in the summer pack.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to the Granite Belt and the Southern and Central Tablelands, for on the spring treatment the orchard and vineyard get the succeeding crop of fruit very largely depends. The surface of all orchards and vineyards should be kept loose. In the western districts, irrigation should be applied whenever necessary, but growers should not rely on irrigation alone, and should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch to prevent surface evaporation.

All newly-planted trees should be looked after carefully and only permitted to grow the branches required. All others should be removed as soon as they appear. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, they should be dealt with at once by the use of such remedies as black leaf forty, bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, for if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with bordeaux mixture and lime sulphur according to the schedule recommended by the Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and afterwards at intervals of about three weeks. Spraying for codling moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer localities, a careful check should be kept on any appearance of the fruit fly, and, if found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving much of the earlier-ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with bordeaux mixture, likewise grape vines. Keep a very strict watch on all grape vines, and, if they have not been treated already, do not delay a day in spraying if any sign of an oil spot—the first indication of downy mildew—appears on the top surface of the leaf. Spraying with bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop; but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers may be certain that their grape crop will not take long to harvest.

Where new vineyards have been planted, spraying also is necessary, for if this is not done the young leaves and growth are apt to be affected so badly that the plant will die.

Plate 88.
INTERIOR OF FRUIT MARKET, SYDNEY.

Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

YOUR CHILDREN AND THE SUNSHINE.

THE other day I was reading a fairy story to my small niece—you all know the one where the fairies appear and present the new baby with gifts, beauty and riches, and suchlike things.

Some babies are still presented with these gifts, but there is one gift that every Queensland baby receives, and I do not think that mothers appreciate it nearly as much as they should—the sunshine.

In our various articles you have learnt some of the reasons why so many babies born healthy die in the first year or two of their lives or grow up into children who are always sickly and ailing. Amongst the causes of death are the respiratory infections—that is, infections of the parts of the body concerned with breathing—nose, throat, and lungs. Diseases caused by these infections include the common cold, whooping cough, bronchitis, and pneumonia. We are all so used to seeing people around us with colds, &c., that we have begun to believe that they are not of much importance, that everyone gets them, and it cannot be helped. We must not look at it in this way. In our effort to save our babies the prevention of these diseases is a serious consideration. Of course, while we live in cities and are crowded together in trams, trains, and picture shows, we cannot avoid coming into contact with the germs which cause these diseases. As we told you in our article last month, the germs are sprayed into the atmosphere by children, and alas! sometimes by grown-ups also, coughing and sneezing carelessly and without using a handkerchief.

The best thing to do, therefore, is to start a physical fitness campaign in our own homes and develop our own physical health and that of our babies and children, so that our bodies will be able to resist these germs. This is where our wonderful sunshine can help us quite a lot.

Our spring weather is beginning, so let us think of the ways in which we can use our sunshine to keep our children fit and enable them to build up strong, healthy bodies.

For very many years we have known that sunlight destroys germs: it is the cheapest and safest antiseptic in the world. So open wide your windows and doors and let the sunlight in! Let it have free access to your children's play pens, cots, and play grounds, and destroy these germs of colds and other ills. Some mothers may be afraid that the strong chemical action of the sunlight may cause carpets and curtains to fade, but surely it is better that carpets should fade than that the little ones should lose their colour.

Another value of sunlight which was discovered more recently is that in connection with the cure of rickets and tuberculosis. During the course of treatment it was found that children suffering from these diseases could be cured by exposing their bodies to sunlight for some hours each day, by providing them with food of the right kind, and by giving them the necessary rest and sleep. Surely in a country like ours, where we can grow all the necessary foodstuffs, and where most of the days are bright and sunny, we should not have to cure these diseases at all but should be able to prevent them.

Sunlight is a most important factor in helping the body to make use of the minerals supplied in the food. In our talk on "Baby's Teeth" last year you were told that baby's teeth and bones are built up of two minerals—lime and phosphorus—and a list of the foods containing a good amount of these minerals was given.

However, before the body can use these minerals properly it is also necessary to have a supply of a vitamin known as Vitamin D. We get this vitamin in certain food, such as cod and other fish liver oils, and also to a smaller degree in eggs and butter and milk, but it can also be formed by the action of the sunlight on the skin.

So you see that sunbathing is not used just to provide the skin with a nice coat of tan during the summer holidays, but properly carried out can be a most useful means of giving our children healthy bodies with strong well-built bones and muscles, and a good resistance to disease. Rickets is a disease which causes the bones to remain soft and also affects the nervous system.

Fortunately, we do not find in Queensland the many cases of chronic chest troubles and serious rickets which are found in England and other countries where the sunshine is not as constant as it is here, and where the smoke of factories in the larger manufacturing towns obscures the sunlight, or where very high buildings prevent it from reaching the city streets.

But our doctors tell us that some of our Queensland children suffer with a mild form of rickets and become very pale and lacking in tone. This is likely to happen to children who are brought up in flats which may be on the dark side of a building, and where there is no garden space, or it may happen in parts of the State where the rainfall is sometimes fairly continuous for days or even weeks at a time. Mothers could prevent their children developing this trouble by giving sunbaths regularly while the fine weather lasts, and even during the wet weather suitable shelters or parts of the house could be used for sun and air bathing when the weather does become fine for a few hours.

You see then that the sunshine is first of all Nature's builder—helping baby's body to use his food to the best advantage and to grow strong and resistant. Secondly, it is Nature's doctor, killing the disease germs which would harm our children, or helping to cure them when they do become ill. Next month we shall talk more fully about sunbathing and the method of carrying it out correctly.

You can obtain further advice on this or any other matter relating to the feeding and management of children up to school age by writing to "Baby Clinic, Brisbane." Such letters need not be stamped.

IN THE FARM KITCHEN.

SHORTBREAD RECIPES.

Apricot Prune Shortcakes.

Ingredients: 2 level cups sifted self-raising flour, pinch of salt, 2 oz. butter, ¼ cup castor sugar, 1 egg, ½ cup milk, stewed or canned apricots and prunes, sweetened whipped cream.

Method: Sift flour and salt into basin, rub butter in lightly with fingertips, and add sugar. Moisten with beaten egg and milk, mixing evenly, and place in buttered recess cakepan (about 8 inches square). Bake in moderately hot oven for twenty to twenty-five minutes, and lift on to cake cooler. Cut warm mixture into

two layers, spread with butter, then cover with apricots and stoned prunes, joining the cake layers. Top with more fruit, decorate with sweetened whipped cream, and serve as cake or dessert. Peaches, bananas, strawberries, blackberries, loganberries, apples, rhubarb, raspberries, pineapple, or passionfruit may be used in the same way, and individual shortcakes may be similarly made.

Shortbread.

Ingredients: 3 oz. castor sugar, 7 oz. butter, pinch of salt, 9 oz. flour, 2 oz. rice flour, ½ teaspoon baking powder, citron peel or crystallised fruits.

Method: Sift sugar, salt, flour, rice flour, and baking powder on to marble slab or pastry board. Rub butter in lightly until mixture is crumbly, then knead until firm and smooth. Mould into two round flat cakes, pinch edges neatly, prick centres with fork prongs, mark into sections with knife, and bake on buttered trays in moderately hot oven for thirty to forty minutes until straw-coloured. Leave on trays until cold and crisp before storing in airtight containers.

Oaten Cheese Shortbread.

Ingredients: ½ lb. finely flaked oats or oatmeal, ¼ lb. self-raising flour, salt and cayenne, ¼ lb. finely grated cheese, 1 egg, paprika for sprinkling.

Method: Sift flour into basin, rub butter in lightly with fingertips, then add oats, grated cheese, and season with salt and cayenne. Mix with beaten egg to form a smooth short paste, press evenly into a buttered swiss roll pan, forming a thin layer, brush surface with milk or beaten egg, and sprinkle with paprika. Mark into finger-lengths and bake in moderately hot oven for twenty to thirty minutes. Cut into marked shapes, leave on tray until cold, then serve with curled celery or other savories.

Australian Shortbread.

Ingredients: 10 oz. rolled oats, ½ teaspoon salt, 4 oz. brown sugar, 4 oz. butter, 1 tablespoon golden syrup.

Method: Melt butter and syrup in saucepan, stir in sugar, salt, and rolled oats, mix well, and press into a buttered swiss roll pan, forming an even layer. Bake slowly in moderately hot oven for twenty to thirty minutes. Cut into required shapes while hot, leave on trays until cold, then store in airtight container.

Ginger Shortbread.

Ingredients: ½ lb. flour, ½ teaspoon baking powder, 1 teaspoon powdered ginger, 3 oz. sifted icing sugar, 4 oz. butter, 1 egg, ½ cup chopped preserved ginger, castor or icing sugar for sprinkling.

Method: Sift flour, salt, baking powder, powdered ginger, and icing sugar into basin and lightly rub in the butter. Moisten with beaten egg, forming a short paste. Knead until smooth, then press or roll to ¼-inch thickness. Place on buttered swiss roll tray, sprinkle with chopped ginger, and cut into triangles or other shapes. Bake slowly in moderately hot oven, until firm and lightly coloured, then sprinkle while hot with castor or icing sugar, and leave on trays until crisp and cold.

Chocolate Shortbread.

Ingredients: 3 oz. sifted icing sugar, 6 oz. butter, 1 egg, 3 tablespoons hot milk, 1 dessertspoon cocoa, 10 oz. flour, ½ teaspoon baking powder, pinch of salt, 2 tablespoons brown sugar, ½ cup seeded raisins, ½ cup chopped nuts or ground almonds.

Method: Mince the seeded raisins and mix with brown sugar and ground almonds or chopped nuts. Blend cocoa with hot milk and leave to cool. Cream butter and sifted icing sugar, gradually add beaten egg, milk, cocoa, sifted flour, baking powder, and salt. Knead until smooth and roll half the mixture thinly, to line a buttered swiss roll tin. Spread evenly with thin layer of raisin filling, cover with second portion of thinly rolled paste. Brush surface with milk or beaten egg, and either sprinkle with chopped nuts before baking or cover with thin layer of icing after cooking. Bake in moderately hot oven for about twenty minutes, cut while hot, and leave on trays until cold.

Shortbread Squares.

Ingredients: 7 oz. flour, pinch of salt, 1 oz. cornflour, 5 oz. butter, 3 oz. castor sugar, 1 egg, 2 oz. blanched chopped almonds.

Method: Cream the butter and sugar, add egg yolk, sifted flour, salt, and cornflour, mixing to a firm smooth paste. Press or roll and place in buttered swiss roll pan, forming a thin even layer. Pinch edges with thumb and finger, brush surface with egg white, and sprinkle with prepared almonds. Mark into small squares, bake slowly in moderately hot oven until firm and lightly coloured, then cut while hot and leave on tray until cold and crisp.

STRAWBERRY RECIPES.

Steamed Strawberry Sponge Pudding.

Mix together 5 oz. self-raising flour and a pinch of salt. Cream ¼ lb. each of butter and sugar, stir in two well-beaten eggs, and then gradually add a little milk. Sift in the flour. Have ready buttered a pudding basin or mould in which ½ lb. fresh strawberries have been packed, generously sprinkled with sugar. Pour in the sponge mixture, cover basin tightly and steam for 1½ hours. Serve with a sweet white sauce to which a few crushed berries have been added.

Strawberry Charlotte Meringue.

Line a buttered pie dish with fingers of sponge cake. Pour in on top of them ½ lb. freshly sieved strawberries, sweetened to taste. Then cover with the very stiffly beaten whites of three or four eggs, sprinkle with castor sugar, and bake in a very slow oven until the meringue is slightly browned. Serve with custard made from the egg yolks or with cream if available.

Pineapple Strawberry Meringue.

Peel large pineapple, with sharp knife cut out hard core entirely. Fill cavity with fresh strawberries, previously hulled, washed, and sprinkled with sugar. Place pineapple on side lengthwise in fireproof dish, cover it with meringue made by whipping whites of 4 eggs with 4 tablespoons sugar till stiff. Place in moderate oven, lower heat, and cook slowly till meringue hardens—about 1 hour. Serve cold with cream.

Strawberry Marmalade.

Take firm, ripe strawberries, wash and pick off stalks, then to each cup strawberries add cup sugar. Place in layers in bowls, putting thick layer strawberries first, then sugar, and so on until strawberries all are used. Allow stand two days, then put in preserving pan, cook gently until marmalade is thick. Remove from fire, add juice lemon to each 4 cupfuls marmalade. When cooked and bottled, the strawberries will be surrounded by thick, clear jelly.

Strawberry Shortcake.

For shortcake: 9 oz. self-raising flour (or plain with 4 level teaspoons baking powder); ½ level teaspoon salt, 3 dessertspoons castor sugar, 3 oz. butter, 1 egg, about ½ gill milk. Sift flour, salt into basin, rub in butter, add sugar. Beat up egg, stir it into mixture with sufficient milk to make soft dough. Grease deep sandwich tin. Turn dough on to lightly-floured board, roll to size of tin; place dough in tin, pressing lightly to make it fit. Bake in fairly hot oven about half-hour. When cooked turn out carefully, leave on cake rack till cold. For filling: 1½ gill cream, about 1 lb. strawberries, ¼ lb. castor sugar, vanilla flavouring. Hull strawberries, cut in halves with stainless knife. Dredge with castor sugar; let stand while cake is cooking and cooling. Whisk cream till stiffens, sweeten with little sugar and flavour with vanilla. Split shortcake in half, spread layer cream over two cut sides, cover lower half with some of the prepared strawberries, put other half cake on top. Spread top with remainder cream, decorate with the rest of the strawberries.

IN THE FARM GARDEN.

IMPROVING SPRING FLOWERS.

DR. D. A. HERBERT.

At this time of the year many of the spring annuals are in full bloom or putting out their buds, and a little attention will not only improve the individual size and quality of the flowers but prolong the flowering period. Briefly, there are three main ways of doing this—first, feeding the plants to provide for the increased drain on their resources during the flowering period; second, the removal of spent flowers so that the good material which would have gone to seed production is diverted to a new crop of flowers; and third, protection against disfigurement and destruction by pests.

Liquid manure is simply plant food in a soluble form and which when put round a plant can be taken up and used almost immediately. All plant foods from the soil are taken up in solution, but some of the fertilizers are only slowly dissolved

and are slow in their action—bonedust as an example. Now, when a plant is coming into bud there is a considerable drain on its resources, and the provision of some quickly absorbed fertilizer is of great benefit. You will see this if you feed up some plants and leave a few alongside without manure for comparison.

The first thing is to decide on the liquid manure. Floraphos is excellent, but rather expensive. The three from which the choice is usually made are sulphate of ammonia, soot, and animal manure. Sulphate of ammonia is reasonably cheap, keeps indefinitely, and has no smell. A dessertspoon to a gallon of water makes a good nutrient solution, to be put round the plants at the rate of a gallon to the square yard, and the dose can be repeated at weekly intervals. The action of sulphate of ammonia is improved by the addition of about a third of the quantity of sulphate of iron—say a dessertspoon of sulphate of ammonia and a small teaspoon of sulphate of iron to the gallon. Sulphate of iron leaves a rust stain on clothing, so should be handled carefully.

Soot is another useful material, if it can be obtained. It can be spread round the plants in the dry form, when it acts as a deterrent for slugs, and the fertilizing materials are washed into the soil when it is watered. The most convenient way, however, is to soak a couple of dipperfuls in a bucket of water for a day or so. It is best put in a bag with a stone, as it does not sink very well when it is dry. Much of the value of soot lies in the ammonia it contains. Its disadvantage is that it is dirty stuff to handle: so this can be the consolation of those who cannot obtain it.

The orthodox liquid manure used by home gardeners is of animal origin—urine or manure in suitable dilution. Cow and sheep manure are the safest. They are soaked in a barrel or a bucket—about a pound of manure to the gallon—and left for about a week. For use the liquor is diluted down until it is about the colour of weak tea. For delicate plants such as maiden hair fern or cinerarias the solution can be made weaker, but the colour of weak tea generally indicates a suitable strength for ordinary annuals. There are two disadvantages of liquid animal manure—its smell and its attractiveness to flies; but there is no doubt about its beneficial effect on plants. It should be kept covered while it is fermenting. Urine has much the same effect and should be diluted 1 in 4 or 5 and applied at the rate of a gallon to the square yard. Fowl manure is much more concentrated than the others and should be diluted down much more.

So much for liquid manure. The second method of improving the flower crop is the systematic removal of spent flowers, and nothing needs to be said about that. If you are saving seed for next year, the best plants should be marked while they are in flower, as it is only by selection that the best varieties can be maintained. The casual collection of any seed that happens to have been produced anywhere in the garden is often the cause of unsatisfactory future crops. The flowering period is the best time for marking for destruction any poor types that are bound to appear from time to time and to prevent their multiplying up in future years.

The third point is protection against pests. Many of our annuals can be grown to perfection and then ruined by one of the innumerable pests just as they are coming into flower. Slugs are amongst the most annoying of these things. They do their damage at night and are hard to locate in the daytime. Hand picking at night with the aid of a torch helps to keep them down, but it is a tedious way of spending an evening. Trapping or baiting is much more satisfactory. Slugs are very fond of bran, and if small heaps are put round their haunts and a damp board or brick or even an upturned flowerpot left nearby, they will have their final feast, like condemned criminals, and then camp under the prepared shelter, to be collected next morning. Much better than this, however, is slug bait. Some years ago the amazing efficiency of metaldehyde in poisoning slugs was discovered, and this method has superseded the older types of poison such as Paris Green. Metaldehyde can be bought from hardware stores under the name of Meta fuel—a white substance in the form of tablets. One tablet is crushed and mixed thoroughly with a cup of bran and small heaps (about an eggcupful) are left round the haunts of the slugs. In wet weather the bait needs a cover. Ready-mixed bait can be bought in packets, but is more expensive than the home-made material. Meta should be kept out of the way of children, as the white tablets might be mistaken for lollies. The bait is a specific for slugs and snails and is not of value for controlling insects.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1941 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1941.	July, 1940.
	In.		In.	In.
North Coast.				
Atherton	1·13	40	0·73	0·90
Cairns	1·55	59	0·47	0·94
Cardwell ..	1·37	69	0·51	0·96
Cooktown ..	0·97	65	1·20	2·28
Herberton ..	0·88	55	0·53	0·63
Ingham	1·67	49	0·52	0·63
Innisfail	4·77	60	1·86	3·98
Mossman Mill ..	1·27	28	0·98	0·27
Townsville ..	0·64	70	0·01	0·01
Central Coast.				
Ayr	0·69	54	0·25	Nil
Bowen	0·92	70	0·20	Nil
Charters Towers ..	0·64	59	0·06	Nil
Mackay P.O. ..	1·65	70	0·01	0·12
Mackay Sugar Experiment Station	1·44	44	0·01	0·11
Proserpine ..	1·54	38	0·06	0·03
St. Lawrence ..	1·37	70	0·28	1·45
South Coast.				
Biggenden ..	1·42	42	0·20	0·35
Bundaberg ..	1·86	58	0·12	0·67
Brisbane ..	2·19	89	0·64	0·32
Caboolture ..	2·41	65	0·24	0·78
Childers	1·73	46	0·17	1·08
Crohamhurst ..	2·95	48	0·33	2·18
Esk	1·94	54	0·35	0·27
South Coast—contd.	In.		In.	In.
Gatton College ..	1·40	42	0·48	0·11
Gayndah	1·48	70	0·10	0·81
Gympie	2·09	71	0·24	0·93
Kilkivan	1·51	60	0·25	1·21
Maryborough ..	1·95	70	0·23	1·11
Nambour ..	2·72	45	0·30	2·86
Nanango	1·67	59	0·41	1·15
Rockhampton ..	1·74	70	0·15	0·61
Woodford ..	2·35	54	0·36	0·86
Central Highlands.				
Clermont ..	1·05	70	0·40	Nil
Gindie	1·08	42	..	Nil
Springsure ..	1·19	72	0·18	Nil
Darling Downs.				
Dalby	1·72	71	0·75	0·43
Emu Vale ..	1·57	45	0·63	Nil
Hermitage ..	1·66	36	..	Nil
Jimbour	1·48	62	0·55	0·55
Miles	1·62	56	0·39	0·44
Stanthorpe ..	2·00	68	0·82	0·13
Toowoomba ..	2·07	69	0·97	0·16
Warwick ..	1·80	76	0·72	Nil
Maranoa.				
Bungeworgoral ..	1·32	27	..	Nil
Roma	1·43	67	0·21	0·15

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1941.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means.		Shade Temperature. Extremes.				Rainfall.	
		Max.	Min.	Max.	Date.	Min.	Date.	Total	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg		Points.	
Cooktown	..	77	64	80	10	53	13	120	10
Herberton	..	70	45	75	5	28	12	53	3
Rockhampton	30·16	74	49	81	8	41	25, 27	15	1
Brisbane	30·15	70	48	78	16	41	28	64	3
Darling Downs.									
Dalby	..	67	36	74	14	26	25	75	2
Stanthorpe	..	60	31	66	15	22·1	27	82	5
Toowoomba	..	62	43	68	16	35	23	97	5
Mid-Interior.									
Georgetown	30·10	81	47	85	3, 4, 5, 15, 16	29	12	Nil	..
Longreach	30·19	76	41	83	3,4	34	12	Nil	
Mitchell	30·22	67	33	75	1, 4, 15	25	27, 28	47	1
Western.									
Burketown	..	81	50	90	20	38	12	Nil	..
Boulia	30·18	73	43	84	3	36	11	Nil	..
Thargomindah ..	30 20	67	39	74	14	32	11	..	..

ASTRONOMICAL DATA FOR QUEENSLAND

OCTOBER, 1941.

By A. K. CHAPMAN, F.R.A.S.

SUN AND MOON. AT WARWICK.

Oct.	SUN. Rises.	SUN. Sets.	MOON. Rises.	MOON. Sets.
	a.m.	p.m.	p.m.	a.m.
1	5.33	5.53	2.10	2.42
2	5.32	5.53	3.7	3.25
3	5.30	5.53	4.1	4.4
4	5.28	5.53	4.55	4.42
5	5.27	5.53	5.48	5.17
6	5.26	5.54	6.41	5.52
7	5.25	5.55	7.32	6.27
8	5.25	5.56	8.24	7.6
9	5.23	5.57	9.15	7.44
10	5.22	5.57	10.5	8.24
11	5.21	5.58	10.55	9.9
12	5.20	5.58	11.43	9.55
13	5.19	5.59	nil	10.44
			a.m.	
14	5.17	5.59	12.29	11.37
				p.m.
15	5.16	6.0	1.15	12.32
16	5.15	6.1	1.58	1.29
17	5.14	6.1	2.41	2.28
18	5.13	6.2	3.23	3.30
19	5.12	6.2	4.6	4.33
20	5.11	6.3	4.50	5.39
21	5.10	6.4	5.36	6.46
22	5.9	6.4	6.25	7.52
23	5.8	6.5	7.17	8.58
24	5.8	6.6	8.12	10.1
25	5.7	6.6	9.9	11.0
26	5.6	6.7	10.8	11.53
27	5.5	6.7	11.7	nil
			p.m.	a.m.
28	5.4	6.8	12.5	12.41
29	5.3	6.9	1.2	1.25
30	5.2	6.9	1.58	2.5
31	5.1	6.10	2.51	2.42

Phases of the Moon.

5 October, Full Moon, 6.32 p.m.
13 „ Last Quarter, 10.52 p.m.
21 „ New Moon, 12.20 a.m.
27 „ First Quarter, 3.4 p.m.

THE WORLD NEAREST THE SUN.

THE most interesting planet to watch during the early part of this month is Mercury. It appears high and bright above the western horizon at dark and does not set until nearly 8 o'clock. In England, few people ever see Mercury, and it is said, that the great astronomer Copernicus, who lived in Poland, never saw it. In high latitudes Mercury never appears far above the horizon. Mercury will be at its highest on 3rd October. Excepting Venus, it appears as the brightest "star" in the west. While looking at the planet, it is interesting to remember that this little world is but 3,000 miles in diameter. Its average distance from the sun being only 36 million miles, the solar heat there would be about seven times greater than it is here. As it always keeps one hemisphere toward the sun, as the moon does to the earth, the temperature on the sunny side would be sufficient to melt lead or tin. Little can be seen of Mercury, but it is thought to be in a very similar condition to the moon—without atmosphere, waterless (and, therefore cloudless, and with a surface of bare mountain peaks and plains of tumbled rock.

THE SHEPHERDS' STAR.

Well above Mercury is Venus, the Evening Star, sometimes called the Shepherds' Star by French sheepmen. It is the most brilliant of all the planets or stars. Venus was behind the sun in April, but is now coming toward us on its circular path round the sun. Next month it will appear at its highest in the sky, but although afterwards it will set earlier, its brilliancy will increase until after Christmas, when it will give enough light to throw shadows upon the earth in places far from city lights. Venus is much larger than Mercury. It is almost as large as the earth, and is sometimes our nearest neighbour. It is rather tantalising, however, to think that when at its nearest it is between us and the sun, and cannot be seen. When we can see it, its surface is always veiled with dense clouds so that we know nothing about its physical features. We do not know the length of its day or the position of its poles.

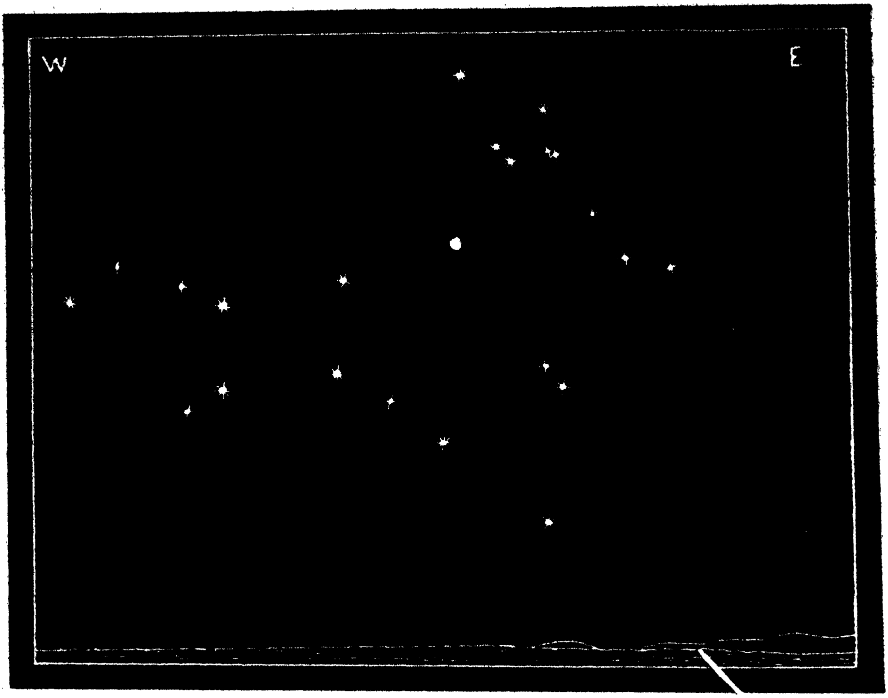
Beyond the earth, from the sun, is Mars. Beyond that is Jupiter, the first of the giant planets, and then comes Saturn. Saturn rises first, about 9.30 p.m., near the Pleiades. Two hours later Jupiter comes up, north of Orion. Both of these great planets are growing brighter as they approach the earth. Jupiter is 435 million miles from us at present. This great distance dwarfs, to the size of a star, a world so large that it could contain 1,300 earths. Like Venus, Jupiter is for ever enshrouded by dense clouds, but the clouds of Jupiter are always in a state of turmoil and are rich in colour. They are formed into belts north and south of its equator, and in some of them rows of black or white spots appear at times.

SHORT DAYS ON JUPITER.

There are markings on Jupiter which are semi-permanent, and from these the length of a day and night up there is found to be only about 10 hours.

Saturn is the next planet beyond Jupiter; the farthest world which can be seen by the naked eye. It is not as large as Jupiter, although 760 earths could be stowed away within its mighty globe. Saturn is much less brilliant than Jupiter, shining with a rather dull yellow light. Its globe has cloud belts, but at its great distance—787 million miles at the beginning of October—they appear very faint. What is seen well is Saturn's unique system of rings, which stretch outward, like a great platform, 48,500 miles wide. On such a platform, six worlds like ours could roll abreast. However, it is not solid, but probably composed of innumerable fragments of rock, all revolving round the great globe in their own orbits. Once upon a time, perhaps, these rings formed a moon which, for some reason moved in too near the great planet, whose enormous gravitational pull gradually dragged it to pieces.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.



LOOKING NORTH AT MIDNIGHT.

Midnight is far too late for most country folk to go star-gazing. But the Red Planet, Mars, will be on the meridian—a line from over the observer's head due north—at midnight, at its brightest and almost at its nearest to the earth on 10th October. It may be interesting, therefore, to show him and the neighbouring stars. As Mars reaches the meridian at midnight, he may be seen all the evening, with the surrounding stars, climbing the eastern sky, shining with his well-known ruddy hue, brighter than any of his neighbours. Mars is shown as a round dot a little above the centre of the picture. West of Mars is Pegasus, the Winged Horse, his curved neck stretching, almost to the edge of the picture. The four stars forming his body comprise the Great Square of Pegasus. From the north-east corner a line of three stars forms Andromeda. The constellation east of Mars is Cetus, the Sea Monster. Between Cetus and Andromeda are the two chief stars of Aries, the Ram.

MARS—OUR NEXT DOOR NEIGHBOUR.

Owing to the peculiar motion of the earth and Mars, it is only once in nearly two years and two months that he comes into opposition to the sun. Mars will be at its nearest to us on 3rd October when the distance will be 38,133,000 miles. Sometimes the Red Planet comes within 34 million miles; that happened in 1924. He came fairly close in 1938, within 36½ million miles. Mars is 4,215 miles in diameter, but at this great distance he only appears as a point of reddish light. In a small telescope, however, a distinct disc is seen; in large telescopes markings appear and on photographic plates much fine detail is imprinted. At the 1938 opposition, 8,000 plates were taken with a special camera and the 27-inch refracting telescope, at the observatory at Bloemfontein. A great amount of detail was found upon the plates and some of the features seem to have changed in shape from the previous opposition. It is in this way that astronomers keep an eye on our neighbouring world. Mars is the only planet whose solid surface we can study, as its atmosphere is, to a large extent, free of clouds. From these markings the Martian day is found to be 24 hours 37 minutes.

Girdling the planet, roughly within its tropics, are irregular grey or greenish regions; most of the remainder of the planet being of a reddish hue, which has caused Mars to be called the Red Planet.

MELTING SNOWFIELDS.

At each pole there are white caps, quite likely of snow. These polar caps dwindle as the Martian spring advances, and sometimes disappear toward the end of the summer. The reddish regions are thought to be sandy deserts and are almost featureless. The most interesting are the greenish tinted parts which girdle the planet. Much detail, considerable seasonable changes, and a wealth of colour are observed in large areas. According to some astronomers these seasonable changes are very similar to what might be expected from the seasonal surge and decline of life in vegetation. If it is vegetation, it may be very different to what we know upon the earth, perhaps only a smear of lichen upon the Martian rocks, or it may be of more luxuriant growth. These darker areas were once thought to be seas, but it is fairly certain that there are no large bodies of water on the planet. Cloud or mist is sometimes seen and the dark areas have probably a moister climate than the reddish country. The world has an atmosphere in which clouds float, but it is not nearly as dense as ours, and it is considered that life, such as we know it, could not exist there. The temperature, even at the equator, is very cold. At midday a thermometer may rise a little above 50° Fahr., but at sunset it would drop below freezing point and the nights must be very cold indeed.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling, members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

Vol. LVI. 1 OCTOBER, 1941 Part 4

Event and Comment

Queensland's Agricultural and Pastoral Year.

GENERALLY, the year in agriculture and animal husbandry was one of high production and sound progress, as set out by the Under Secretary of the Department of Agriculture and Stock, Mr. R. P. M. Short, in his annual report to the Minister, Hon. Frank W. Bulcock, for the year ended 30th June last, which was presented to Parliament in the course of the month. In the course of his review, Mr. Short stated that the estimated number of sheep is slightly below the record total of the previous year, but it is higher than the total for any other year. The estimated number of cattle is the highest total recorded since 1st January, 1926.

Fat lamb production is making satisfactory progress. Numbers have increased and quality has improved.

The natural grasses over large tracts of Central and Western Queensland have made an excellent recovery, and pastures, although mostly dry at the close of the year, are sufficient to maintain sheep for several months to come.

Registrations of horse and cattle brands show an increase for the year, but there was a slight decrease in the number of sheep brands and earmarks registered.

It has been possible during the year to consolidate and improve the veterinary services supplied to stockowners of the State, and all departmental activities in connection with animal diseases are now co-ordinated by the office of the Director of Veterinary Services.

There have been no major outbreaks of animal disease, but the buffalo fly spread to some extent owing to the particularly favourable climatic factors operating in the Gulf country. Because of the risk of the spread of this pest to areas of dense cattle population on the coast, vigorous preventive measures are being adopted, and spraying plants have been erected at selected centres on the Northern railways.

To ascertain the position more exactly and to enable proper investigations to be carried out, several important stock diseases have been the subject of special survey and inquiry.

The Animal Health Stations at Yeerongpilly and Oonoonba have continued to render valuable service to stockowners of Queensland. Vaccine and other materials prepared by these stations have given excellent results to users. Work has been continued in conjunction with the Poison Plants Committee into the testing of suspected poisonous plants, and a number of plants were submitted during the year for feeding purposes.

The output of 759,000 tons of sugar manufactured from 5,180,000 tons of cane was 132,000 tons below the record yield of the previous year. The full crop was satisfactorily disposed of at a gross value of just over £13,000,000. The average price per ton was the best since that of the 1932 season. The preliminary estimates for the 1941 season suggest that a similar crop to that of 1940 will be available for harvest. The Government has acquired the full 1939 peak quotas for each mill which, if filled, would provide 737,000 tons. The actual production within these limits is likely to be something slightly less than the full quota. Greater difficulty is anticipated in regulating overseas shipments, and it is probable that much of the production of the current season will have to be stored.

Good early rains were experienced and wheat sowings were completed under excellent conditions. The quantity of wheat harvested for grain totalled 5,600,000 bushels from an area of 302,003 acres. For the third year in succession the yield was considerably above the average, and the grain was of high quality. Queensland-bred wheats continue to increase in cultivation, and now constitute approximately 77 per cent. of the total acreage sown.

Returns from the maize districts indicate that both the total area sown and the total yield of grain will be above the average for the State. Because of prolonged wet weather during the ripening of the crop and during the harvesting period, yields on the Atherton Tableland were not as heavy as were earlier anticipated.

Climatic conditions in the cotton-growing districts were variable and, as a whole, were generally unfavourable for the production of satisfactory yields. In spite of this fact, a total of 12,262,498 lb. of seed cotton was received by the end of June at the two ginneries operating. This is a substantial increase on the figure for the corresponding period of the previous season—8,605,496 lb.

The area sown to grain sorghums once again showed a very substantial increase, and a keen demand existed for all grain produced. The value of the grain for stock or poultry feeding purposes is now more widely appreciated, and is likely to encourage large-scale production of sorghums for grain purposes.

Because of erratic seasonal conditions and damage by insect pests, results in all tobacco districts were not as good generally as those obtained during the previous year.

Peanut growers generally had satisfactory results, and some very high yields were obtained. The seed selection work conducted by departmental officers for some years past has resulted in a very definite improvement in type of plant and quality of nut.

The potato crop generally was satisfactory, and the total yield for the State is estimated to be above average.

The services of the soil conservation officer have been much in demand during the year, and large areas of eroded land in various districts have been treated. These demonstrations have aroused keen interest and much appreciation by local landowners.

The fact that during the year a record number of requests for information on silage were received from graziers is an indication of the increasing interest which is being taken in fodder conservation.

In spite of difficulties caused by irregular seasonal conditions, the occurrence of pests, and the restriction of export markets, the fruit industry continued to progress steadily throughout the year.

The avocado—a comparatively new fruit to Queensland—has gained a great deal of favour, and the area under trees has more than doubled in two years.

The Division of Plant Industry (Research) has completed another successful year of investigational work on a wide range of problems associated with many crops of major importance. Plant breeding in both agriculture and horticulture is a prominent feature of its activities, pasture investigations are conducted both on the coast and in the far West, and a very considerable amount of attention is also devoted to general horticultural problems, particularly to those of a nutritional nature.

Because of its wartime importance, cotton has received an unusually large share of attention, and numerous plant breeding, entomological, soils, irrigation, and plant physiology problems which have arisen since cotton became an important feature in the rural economy of the State have been dealt with energetically.

Because of unseasonal conditions, the output of dairy produce fell below the figure of the previous season. Butter production for the year was 117,081,269 lb., valued at £7,517,172, compared with 139,795,042 lb., valued at £8,862,037 for 1939-40. Cheese production was 11,731,976 lb., valued at £390,000, compared with 13,841,405 lb., valued at £452,182 for 1939-40.

Butter quality showed an improvement over the results of the previous year. This may be attributed, in some measure, to the fact that considerable progress was made in bringing farm buildings and facilities into conformity with regulation requirements for the production of high-quality milk and cream. A marked improvement in factory hygiene and the manufacture of a butter of more uniform and economical composition have been attained as a result of the butter improvement service which provides for the regular scientific examination of the produce of all factories. A progressive improvement in cheese quality has been achieved over the past three years.

The amount distributed annually to primary producers in respect of products disposed of under producer-controlled organised marketing schemes now exceeds £22,000,000.

Fertilizing Pineapples in War Time.

H. K. LEWCOCK, M.Sc., B.Sc.Agr., Senior Research Officer.

Why Rationing of Fertilizers is Necessary.

IN Australia, as in most other countries, a high level of efficiency in crop production can be maintained only so long as fertilizers in one form or another are available to supplement or correct deficiencies in the store of plant foods contained in the soil. Of the mineral plant foods, those required in greatest amounts are nitrogen, phosphoric acid, and potash. Unfortunately, Australia is dependent on overseas sources for the whole of its supply of potash, a very large proportion of its phosphoric acid, and about half its normal requirement of nitrogen. Realising this, it will not come as a surprise to anybody that shipping difficulties arising out of the war have made it necessary to ration existing stocks of fertilizer in order that they may be used to the best possible advantage. The aim of rationing is to ensure (1) that essential requirements will be met, (2) that distribution will be on an equitable basis, (3) that hoarding will be prevented, (4) that fertilizers will not be wasted or used unnecessarily, and (5) that stocks of ingredients now unobtainable will be conserved to the greatest possible extent, compatible with essential requirements. No one can possibly have any quarrel with these objectives. It is inevitable, however, that rationing of fertilizers must have an effect on those primary industries in which efficient production depends largely on fertilizing practices. The pineapple industry figures prominently in this category; in fact, few crops have been shown to have a higher requirement for nitrogen and potash than pineapples. Furthermore, the kind of nitrogenous fertilizer which is utilised most efficiently by the pineapple plant is sulphate of ammonia, and this is the one of which the supply has been most affected by war conditions. In recent months it has become necessary to divert large quantities of sulphate of ammonia from consumption for agricultural purposes to the manufacture of munitions. With all these considerations in mind, it is almost superfluous to add that it behoves every grower in his own interest to use whatever fertilizer may be made available to him to the utmost advantage. The question arises, however, as to how this may best be accomplished. Obviously, if the amount available is less than that normally used, some modification in existing fertilizing practices will be necessary.

How Rationing will Operate.

Rationing is to apply to both mixed fertilizers and to straight sulphate of ammonia. Potash in any form will not be available as a "straight" fertilizer, as it may be sold only when incorporated with nitrogenous and phosphatic ingredients to form a mixture. Bona fide pineapple growers will still be able to obtain mixtures prepared according to the "10-6-10" formula, though in reduced quantity. It may be added that of all the fertilizer mixtures registered for sale in Queensland the "10-6-10" formula for pineapples is the only one which, under the rationing scheme, has not been reduced in either its nitrogen or potash content, or in both. As previously, the whole of the nitrogen contained in the "10-6-10" mixtures now on sale is in the form of sulphate of ammonia and the whole of the phosphoric acid is in the form of superphosphate. However, because sulphate of potash is no longer obtainable from overseas sources of supply—and will, in fact, be wholly unobtainable until after the war—it has become imperative

to drastically curtail the use of this ingredient in fertilizer mixtures in order to conserve existing stocks, all of which were landed prior to or immediately following the outbreak of war. The whole of these stocks is reserved for use in either the pineapple or tobacco industries, but as the quantity held is insufficient to permit of a rate of consumption greater than 25-30 per cent. of the pre-war level it has been found necessary to supplement the amount of "10-6-10" mixture which this quantity of sulphate of potash provides with a mixture of identical formula, but containing muriate of potash in lieu of the sulphate form. While it has long been known that the muriate form of potash is not as suitable as the sulphate form for application to pineapples, except during the early stages of growth, it is still highly beneficial and, in fact, its use as a supplier of potash is essential for profitable pineapple production on all soils except those containing relatively high amounts of this plant food in an available form. In the recognised pineapple-producing districts of Queensland, potash-rich soils occur only in the Mary Valley, Rockhampton, Bowen, and Burdekin districts, and on Magnetic Island.

For the time being, it is proposed that pineapple-growers will be able to obtain fertilizer in the proportions of $\frac{9}{14}$ of their previous year's purchases of "10-6-10" mixture and $\frac{7}{14}$ of their previous year's purchases of sulphate of ammonia. These amounts represent approximately $\frac{2}{3}$ and $\frac{1}{2}$ respectively of the quantities normally used. Of the "10-6-10" mixture allotted to them, growers will be permitted to take up to $\frac{4}{9}$ in the form of the mixture containing sulphate of potash, but the remaining $\frac{5}{9}$ can be obtained only in the form of the mixture containing muriate. Where no purchasers have been made previously, as in the case of new growers, or where the amount allocated is insufficient to meet requirements, as in the case of a grower who commenced planting during the previous season and who proposes extending his acreage this year in order to build up a living area, an application for a permit to purchase fertilizer must be made on the approved form which can be obtained from the Department of Agriculture and Stock. Each application will be considered on its merits. On potash-rich soils in the Mary Valley and in the other districts mentioned, the use of mixtures containing potassic salts is discouraged. However, as the requirement for nitrogen is generally as high on potash-rich soils as it is on those which are deficient in this plant food, growers cultivating such soils will be permitted to purchase a quantity of sulphate of ammonia additional to the basic ration of $\frac{7}{14}$ of last year's purchases. This additional amount will correspond approximately to the proportion which growers in other districts are able to obtain as an ingredient of "10-6-10" mixture. It should be clearly understood, however, that in no district whatever is the use of any kind of "10-6-10" fertilizer mixture now permitted except on pineapples.

Adjusting Fertilizing Practices to Meet the Curtailment in Supplies.

As the amounts of "10-6-10" mixture and sulphate of ammonia which pineapple-growers will now be able to obtain are, respectively, only $\frac{2}{3}$ and $\frac{1}{2}$ of those which they used in the preceding twelve months, these reduced quantities will need to be applied with discretion if maximum benefits are to accrue from their use. It may be stated at the outset that better results are likely to be obtained from fertilizer applications made during the first two or three years of the crop cycle than from those made subsequently. Plantations which have been adequately

fertilized over the period mentioned can be relied upon to yield a payable second ratoon crop without further fertilizing, even though this may not be quite as heavy as that which would have been obtained had additional fertilizer been employed to produce it. In this connection it is worthy of note that fertilizing of second ratoon crops is rarely practised in Hawaii, where it is the custom to fertilize heavily for the preceding crops. As far as possible, therefore, growers are advised to concentrate on maintaining an adequate supply of plant nutrients for the younger portions of their plantations, even if this can be done only at the expense of the older ratoon fields. Except in areas which are producing exclusively for the fresh fruit trade, the withholding of fertilizer after the first ratoon crop has been harvested is recommended as being the best means of adjusting plantation practices to meet the current fertilizer shortage. If this recommendation is adopted it will be found, in most cases, that the quantity of "10-6-10" mixture which growers are still able to obtain is sufficient to enable existing rates of application to be maintained until the end of the third year from planting. As already mentioned, however, not more than $\frac{4}{9}$ of this amount can be purchased in a form containing sulphate of potash, which, though superior to the muriate form during the bearing period, is no more effective when applied in the early stages of growth. Obviously, then, the muriate form of "10-6-10" mixture should be used exclusively during the first twelve months after planting, and the sulphate form should be reserved for use during the most productive period of the cycle—that is, the second and third years from planting. Normally, three applications of the "10-6-10" mixture containing muriate should be given on newly-planted areas before changing to the sulphate mixture. In the case of spring-planted fields, the first of these applications would be given some two to three weeks after planting, the second in the autumn, and the third in the following spring. Each of these applications would be made at the rate of 40-50 lb. per 1,000 plants. Any "10-6-10" mixture containing muriate of potash which is not required for application to new plantings may be used on the older portions of the plantation in lieu of sulphate mixture. These latter applications, whether of the sulphate or muriate form, should be given twice yearly—that is, in the spring and again in the autumn—up to the end of the third year from planting, and the rate of application should be 40-50 lb. per 1,000 plants as previously. Where it is desired to apply zinc or copper sulphate with "10-6-10" fertilizer mixture, only the muriate form should be used as a carrier because a deficiency of one or the other of these essential elements in the soil is best corrected at either the first or second fertilizing after planting.

On potash-rich soils such as those of the Mary Valley, on which the use of fertilizer mixtures containing potash is discouraged, applications of sulphate of ammonia should be given at the same times as those recommended for "10-6-10" mixture in other districts, but the rate of appli cation should be only half of that suggested for the mixtures. This is because 50 per cent. of a "10-6-10" mixture consists of sulphate of ammonia. An additional application of ammonia may be given during January, just preceding the period of maximum growth when the demand for nitrogen is greatest. This January application of ammonia should also be given in all districts where the use of "10-6-10" mixture is recommended, but the dressing which it has been customary to apply in mid-winter may be omitted while the present shortage lasts, as the nitrogen requirement of the pineapple plant is relatively low during cold weather. If this plan be adopted, it will not be necessary to reduce

the rate at which the January dressing is applied, because the amount of sulphate of ammonia now available, viz., one-half of that previously used, should be sufficient to enable one application per year to be given at the normal rate.

The preceding suggestions have been made in the hope that they will provide a workable basis on which growers may recast their fertilizing schedules to meet the curtailment in supplies occasioned by war conditions. While it is fully recognised that modifications may have to be made to the programme as set out in order to meet individual circumstances, it is strongly urged that these should be based on the principle of adequate fertilizer for the younger portions of a plantation even if some of the older ratoon fields have to go without. In this connection, it may not be out of place to draw attention to a difference between the "10-6-10" mixtures now on the market and those formerly obtainable which necessitates especial care in applying them if injury to the plants is to be avoided. Until recently, the sulphate of ammonia used in compounding these mixtures was mostly the synthetic crystalline form. Since supplies of this product are no longer available from overseas sources, it has become necessary to use sulphate of ammonia of Australian manufacture. Because the latter is prepared only in powdered form, it is not so readily deposited as the crystals, and there is a risk of some of it lodging on tender leaf tissue and thus causing injury, unless the hand is held well down when applying it. This point is mentioned because it has recently been reported that some growers who have inadvertently burnt plants with "10-6-10" muriate mixture are erroneously attributing the cause of the burning to muriate of potash.

Meatworks Fertilizer as a Substitute for Inorganic Mixtures.

One question which is likely to be raised is whether meatworks fertilizer, such as dried blood and bone, can be used as a substitute for, or as a supplement to, "10-6-10" mixture or sulphate of ammonia. While this can be done with little if any loss of efficiency in the case of crops which respond to fertilizer when it is applied in drills or otherwise buried beneath the surface of the soil, meatworks fertilizer cannot be used effectively for pineapples except, possibly, when placed in the bottoms of furrows which have been opened out along the lines of the rows prior to planting. No experimental data is available regarding the value of this method, though there is every reason to believe that it would be successful. The reason why it has not been tried out before is because nitrogen is cheaper in the form of sulphate of ammonia than it is as dried blood. For application subsequent to planting, however, meatworks fertilizer is not suitable for pineapples, since it is only effective when incorporated with the soil. Because of the surface rooting habits of the pineapple plant serious root injury would result from any attempt to place fertilizer in the soil at a distance close enough to the plants for the roots to have access to it. Experiments have shown conclusively that, with pineapples, the maximum benefit from fertilizer is not obtained unless it is taken into the soil immediately around the bases of the plants. This can be accomplished only by using plant foods in a water soluble form, and by applying them directly into the axils of the basal leaves, from where they can be washed into the soil around the stem of the plant. Apart from sulphate of ammonia, the only other fertilizer ingredient containing water soluble nitrogen that has been available in Queensland is nitrate of soda, which is now wholly unobtainable because of munitions priorities.

Supplementing the Nitrogen Supply by the Use of Green Manures.

Horse, cow, and fowl manure are all rich in plant foods, but only in exceptional cases can they be obtained in useful quantities. A similar position exists with regard to wood ashes, which contain large amounts of potash. As far as nitrogen is concerned, however, green manuring during the intercycle period affords a means whereby a store of this element may be built up in the soil for the use of the succeeding crop. This is a practice which should be more widely adopted at the present time, even if it means lengthening the intercycle period, not only because the supply of nitrogenous fertilizers is more affected by war conditions than that of other plant foods, but also because the pineapple plant requires greater quantities of nitrogen than of any other nutrient. Obviously, only leguminous crops should be used for green manuring purposes, since these are the only ones which possess root nodules capable of fixing nitrogen from the air. When the crop is ploughed under, these nodules decompose, and the nitrogen they contain becomes available for the use of the succeeding crop. Of the summer-growing legumes, Poona pea has been found to be one of the most suitable for Southern Queensland conditions because it comes away rapidly and, under favourable growing conditions, makes a dense cover in a very short space of time. A well-grown crop of Gambia pea (*Crotalaria goreensis*) will fix a greater amount of nitrogen than Poona pea, but as it has to be planted in October or November, because of its slow rate of growth in the early stages, it is sometimes difficult to get a satisfactory stand of this legume, particularly in seasons when the summer rains are delayed. Of the winter-growing legumes, the New Zealand blue lupin or the field pea are likely to prove most satisfactory, but, in Queensland, the degree of success which is obtained with these crops is apt to depend very largely on the incidence of winter rains. It should be pointed out, however, that no leguminous cover crop is likely to give wholly satisfactory results unless the seed is inoculated, prior to planting, with its own particular strain of the nitrogen-fixing organism. It is this organism which is responsible for the development of nodules on the roots of plants belonging to the pea family. For a nominal fee, cultures of nodule-forming organisms for various leguminous crops and particulars regarding their use can be obtained on application to the Department of Agriculture and Stock. Now that this service is available, no leguminous crop should be planted without first taking the precaution to pre-inoculate the seed.

ON THE FARM FRONT.

We may talk about man-power and munitions as the essentials of war, but, after all, food for the people as well as for the fighting forces is just as important. Not only does an army fight on its stomach, but the nation behind the army must be fed too—and fed well if national morale is to be maintained.

In these days of mechanised warfare, the nation that is best prepared is the nation which can grow its own food with the smallest fraction of its man-power, so that the men not needed for growing crops can take time off to train for defence or give a hand in making munitions. Farm machinery has made all the difference in a country's capacity to feed its people. A hundred years ago it took about three out of every four men to feed and clothe the people, but now the position is reversed. It is estimated that, with the use of modern farm machinery, only one man in every four is required to provide the primary needs of a nation. So with up-to-date farm machinery and the will and skill to use it, our farmers must be handed a big share in the coming victory.

The Control of Tomato Pests.

W. J. S. SLOAN, B.Agr.Sc., Assistant Research Officer.

THE tomato plant is attacked by many pests, and good crops can seldom be grown without the use of the necessary control measures. To apply these efficiently requires some knowledge of the several pests, so that damage can be correctly diagnosed and appropriate steps taken to reduce losses.

Tomato pests may be grouped as—I. root and seedling pests, II. stem and foliage pests, and III. fruit and flower pests, in accordance with the part of the plant with which they are principally associated. The following key should simplify the identification of the various pests in the field:—

I. Root and Seedling Pests.

1. Plants stunted; lower leaves wilt and die in dry weather; sudden collapse of plants not uncommon after rain; bead-like swellings of varying sizes on roots.

Nematodes.

2. Plants wilt and die; roots eaten; light-brown, thick-bodied beetles about ¾ inch long present in soil.

Brown Scarab Beetle.

3. Seedlings collapse; stem chewed at or near ground level; one or more larvæ found in soil near stem.

   (*a*) Smooth, soft-bodied, greyish-green or grey-brown caterpillar which curls when touched; 1½ inches long when full grown.

   Cutworm.

   (*b*) Slender, hard, shiny, light-brown larvæ; about ¾ inch long when full grown; adult beetle about ⅓ inch long.

   False Wireworm.

4. Foliage and sometimes the stem eaten; grasshoppers present.

Grasshoppers.

II. Stem and Foliage Pests.

1. Stems rusty brown or smoky-coloured and smooth, leaves wilt and die.

Mites.

2. Lower leaves wilt and die; green leaves show numerous white spots; swarm of green, winged insects about ⅛ inch long on each plant.

Jassids.

3. Small, soft-bodied, green insects, clustering in colonies under leaves and around young growth.

Aphids.

4. Green caterpillar feeding on foliage; 1½ inches long when full grown.

Leaf-eating Looper.

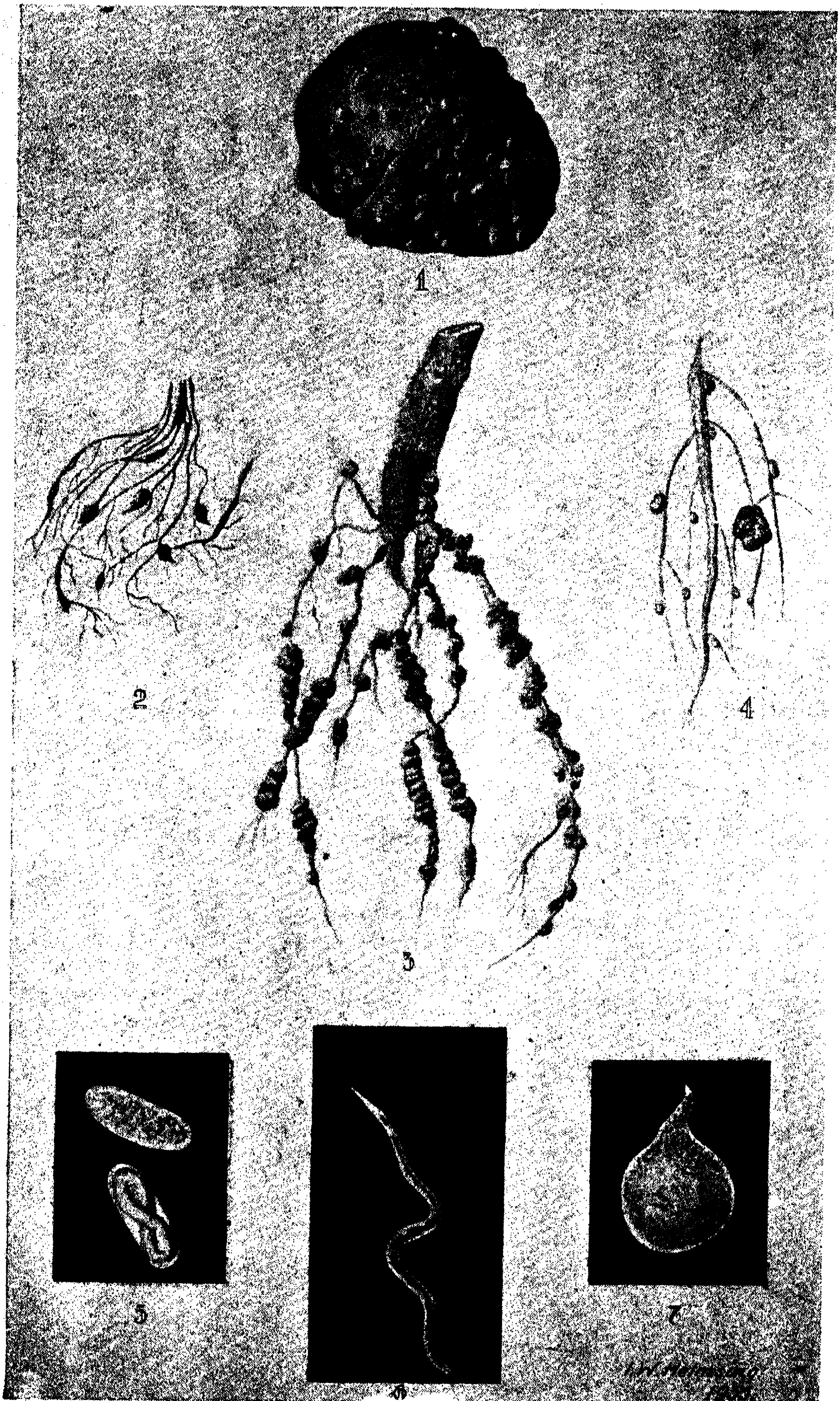


Plate 89.
Root Knot Nematode.

III. Fruit and Flower Pests.

1. Larvæ in or on the fruit.

(*a*) Caterpillar often conspicuously coloured; $1\frac{1}{2}$ inches long when full-grown.

Corn Ear Worm.

(*b*) Dull white or greenish-tinted caterpillar; $\frac{1}{2}$ inch long when full-grown.

Potato Tuber Moth.

(*c*) Soft-bodied, greyish-green or grey-brown caterpillar which feeds at night and remains in soil under plant during the day; $1\frac{1}{2}$ inches long when full-grown.

Cutworm.

(*d*) Fly maggots living in fruit.

Fruit Flies.

2. Fruit with discoloured areas on skin; bugs present.

(*a*) Green shield-shaped bug; $\frac{1}{2}$ inch long.

Green Vegetable Bug.

(*b*) Green or green and brown shield-shaped bugs; $\frac{3}{10}$ inch long.

Shield Bug.

(*c*) Slender, winged, greyish-brown insects, $\frac{1}{6}$ inch long.

Rutherglen Bug.

3. Cream-coloured insects in blossom; $\frac{1}{16}$ inch long.

Thrips.

ROOT AND SEEDLING PESTS.

Nematodes.

Nematodes* (Plate 89, figs. 5, 6, and 7) infest the roots of tomato plants of all ages, but their effects may not be obvious until the plants are setting fruit. Severely attacked plants are stunted and unhealthy, the lower foliage wilts and dies, and the fruit does not fill out. After wet weather, affected plants may collapse suddenly. The presence of nematodes is easily determined by examining the roots, which, when infested, are distorted and somewhat beadlike in shape (Plate 89, fig. 3). On seedlings, the swellings may not be very large.

Nematodes live part of their life in plant tissue and part in the soil, where they can persist for a very long time, even in the absence of food plants. The full-grown female nematode (Plate 89, fig. 7) is white, pear-shaped, and about one-twenty-fifth of an inch in length, and may be seen on the exposed surface when one of the larger root swellings is sliced through with a sharp knife. The very small wormlike male also occurs within the roots, but is more difficult to detect. The eggs (Plate 89,

---

DESCRIPTION OF PLATE 89.

ROOT KNOT NEMATODE.

Fig. 1.—Nematode-infested potato tuber.
Fig. 2.—Nematode galls on strawberry roots.
Fig. 3.—Nematode galls on tomato roots.
Fig. 4.—Bacterial nodules on lupin roots.
Fig. 5.—Nematode eggs × 150.
Fig. 6.—Larval nematode × 150.
Fig. 7.—Adult female nematode × 30.

Figs. 1 to 4 half natural size.

---

* *Heterodera marioni* Cornu.

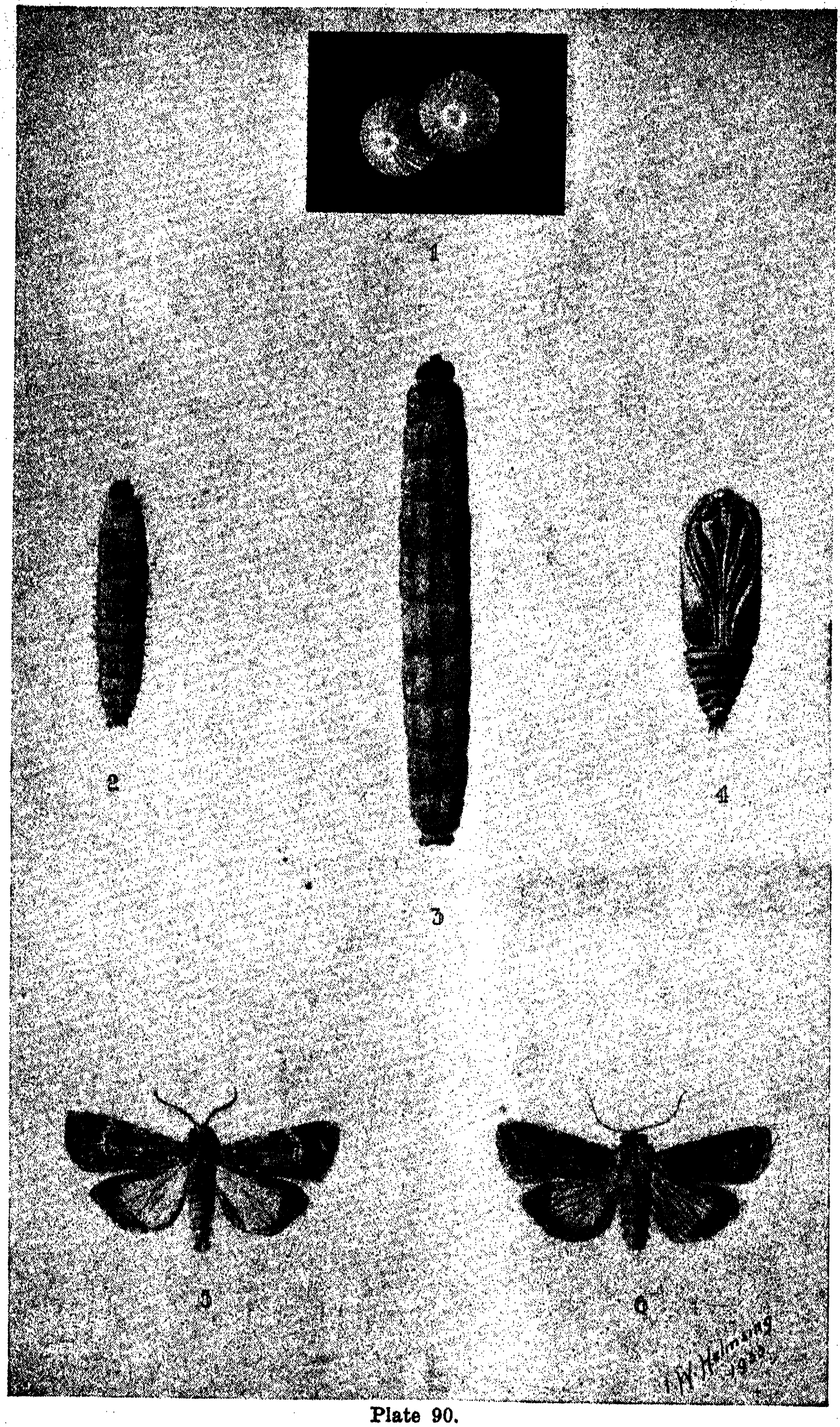


Plate 90.
Brown Cutworm.

fig. 5) are microscopic, and can survive for long periods in the soil. From these emerge young threadlike nematodes, which move about in the soil to a limited extent, and eventually enter plants through the small roots.

Nematodes attack many weeds and crop plants; hence the difficulty in obtaining ground free from infestation. They occur in many soil types, but losses are generally most severe in light sandy loams.

Complete eradication of the pests in infested fields is not practicable. Attention should therefore be directed towards the production of healthy seedlings, and the maintenance of good growing conditions when they are transplanted into the field. The following measures will require attention:—1. Select new ground for seed-beds and fire the bed before planting. This may be done by placing brushwood and branches evenly over the surface to a depth of 6 to 8 inches. The soil should be neither dry nor excessively wet when firing takes place. 2. When removing seedlings for planting, discard any showing swollen roots. 3. Maintain the health of the plants in the field by judicious fertilizing, adequate cultivation, and careful irrigation. 4. Remove and destroy by burning all severely affected plants in the field. 5. Avoid growing tomatoes on the same land for more than two years in succession. Most grasses, maize, wheat, sorghum, peanuts, velvet beans, and certain varieties of cowpeas resist nematode attack, and a suitable rotation including some of these crops, one of which should be a green manure, usually keeps the nematode population at a relatively low level.

Brown Scarab Beetle.

Plants are destroyed by the brown Scarab beetles* which feed on the roots. Outbreaks are sporadic, but very severe. The beetle lives in the soil, and is a typical thick-bodied Scarab, light-brown in colour, and about ¾ inch long. The larvæ are of the white grub type, and occur in soils rich in organic matter or in compost heaps, but so far they have not been recorded as injurious to tomatoes. The use of insecticides is usually not practicable. Thorough cultivation of the field before planting and during the growth of the crop may give some relief.

Cutworm.

The larvæ of several moths are called cutworms because they attack the stems of seedlings at or near ground level, where they can usually be found just below the surface. Feeding takes place at night. Seedlings collapse, but on older plants stem injuries are less important and feeding is then confined mainly to the foliage. On untrellised fruiting bushes large irregular holes may be eaten out of fruit near the ground. Injury to seedlings, which usually takes place shortly after transplanting into an infested field, constitutes the commonest and most serious loss. Severe injury is common in light soils.

DESCRIPTION OF PLATE 90.

BROWN CUTWORM.

Fig. 1.—Eggs × 20.
Fig. 2.—First-stage larva × 8.
Fig. 3.—Final-stage larva × 1¼.
Fig. 4.—Pupa × 2.
Fig. 5.—Adult male, natural size.
Fig. 6.—Adult female, natural size.

* *Isodon puncticollis Macl.*

The moths of the brown cutworm* (Plate 90, figs. 5 and 6), which is a widely distributed pest in Queensland, have greyish-brown or greyish-black forewings with variable markings, and the hind wings are greyish-white, with smoky margins. The wing spread is about 1¼ inches. The females lay batches of eggs on or near the soil surface underneath the leaves of a low-growing weeds. After a few days the eggs hatch, and the young caterpillars feed on the plants at night, sheltering in the soil during the day. The soft-bodied, greyish-green or grey-brown larvæ (Plate 90, figs. 2 and 3) become full-grown in four to seven weeks, and are then about 1½ inches long. They make their way into the soil and pupate at a shallow depth in earthen cells. After a further two to three weeks the adult moth emerges from the pupa (Plate 90, fig. 4).

Cutworms feed on numerous weed and crop plants. If land carrying low-growing weeds is cultivated just before planting, any cutworms present attack the tomato seedlings. Losses may therefore occur in patches or be generally distributed through the field—depending on the distribution of the weed growth before cultivation. The presence of cutworms may be detected by examining the top few inches of soil around the base of a destroyed seedling.

Control measures for cutworm outbreaks are very efficient if properly carried out. Thorough preparation of the soil for the crop is necessary, and weed growth should be suppressed for at least four weeks before seedlings are planted.

When seedling losses are noticed, a Paris green-bran bait must be applied immediately. The bait is prepared as follows:—Thoroughly dry-mix 25 lb. bran with 1 lb. Paris green. Dissolve 1 quart of molasses in a pint of boiling water, and make the solution up to 2 gallons with cold water. Pour the solution slowly on to the poisoned bran, and mix to form a uniformly moist crumbly mash.

If the whole field shows signs of infestation before planting, the bait should be broadcast at a rate equivalent to 50 lb. dry weight of bran per acre; after planting, it may be scattered thinly along the rows close to the plants. If the attack is restricted to a small area, only this, together with a marginal strip, need be treated. When cutworms are very numerous, two or more applications of bait may be required. The bait should always be applied in the evening, because cutworms are night feeders, and the bait must be fresh and attractive when they are seeking food. The bait should not come in contact with the stems of the plants, otherwise injury may occur.

Paper collars are used in some districts to protect seedlings from cutworms and other pests. The size of the paper used depends on the size of the seedlings. For seedlings up to 8 inches high, 4-inch by 3-inch pieces are convenient. The paper is wrapped around the stem, and the seedling is placed in the soil so that there is a 2-inch collar of protecting paper above the surface. Papers are carried on a string attached to the planter's belt and flicked off as required. The method slows up planting to some extent, and does not reduce the field population of cutworms, the progeny of which may later cause injury to fruit borne on untrellised vines.

* *Euxoa radians* Gn.

False Wireworm.

Both the false wireworm and the parent beetle* injure tomato seedlings at ground level in a manner similar to that of cutworms. Occasionally the false wireworm tunnels into the stem for a short distance. When these pests are responsible for seedling injury, either the adult beetles will be found on the soil surface or the hard, slender larvæ may be located just below the surface of the soil near the injured seedlings.

The adults are small, stocky beetles, about ⅓ inch long, the apparent colour of which is similar to that of the soil on which they occur. The larvæ are shiny, light-brown, slender, hard, and about ¾ inch long when full-grown. Eggs are laid in the ground.

The Paris green-bran bait recommended for cutworms efficiently controls both the larvæ and adult beetles; paper collars may also be used.

Grasshoppers.

Adults and nymphs of grasshoppers occasionally attack the foliage and stems of young tomato plants in seed beds and in fields, particularly during dry weather. If the pests are numerous, many young plants may be destroyed, and difficulty be experienced in obtaining a satisfactory strike. A number of species are concerned, ranging from 1 inch to 3½ inches in length, but two† are particularly common in Central Queensland.

Handpicking and the lead arsenate spray usually applied for the control of leaf-eating pests will check small populations of grasshoppers in the seed bed. Where these measures are insufficient, the Paris green-bran bait may be broadcast around the beds for a radius of 30 yards or more.

When a field crop has to be protected, the standard grasshopper bait is more economical than the Paris green-bran bait. It contains arsenic pentoxide ½ lb., molasses 4 lb., bran 25 lb., and water 2½ gallons. The arsenic pentoxide is dissolved in 1 pint of boiling water; the molasses is also dissolved in the same quantity of water in a separate vessel. Both solutions are stirred, and half of the remaining water added to each. The two solutions are then mixed, stirred, and added to the bran which has previously been spread out on a mixing board or sheet of iron. The whole is then thoroughly mixed until a loose even-textured moist mash is obtained.

In an infested field, the bait should be distributed along the rows close to the plants and broadcast around the field for a margin of 30 yards. Several applications at three- or four-day intervals may be necessary if there is a persistent inward migration of the pests.

STEM AND FOLIAGE PESTS.

Mites.

Mites‡ affect tomato plants of all ages. The first symptom of injury is the slight curling of the lower leaves which then show a silvery sheen on the under-surface. Later, these leaves become bronze-coloured, droop, and finally die. The lower part of the stem loses its surface hairs,

* *Dasus macleayi* Blkb.

† *Valanga irregularis* Walk. and *Peakesia straminea* Sjost.

‡ *Phyllocoptes lycopersici* Tryon.

becomes smooth, rusty-brown or smoky-coloured, and may later show small superficial cracks. As infestation increases, the mites gradually spread, discolouring the stems and destroying the foliage, until only the young terminal growth remains. Thus the fruit is exposed to sunburn, plant growth is retarded and blossom setting curtailed. In severe attacks where infestation extends to the terminal growth, the young leaves may be distorted. Fruit may also be attacked; the skin is discoloured and numerous small cracks appear, mainly at the stem end, but sometimes all over the surface. Although edible, such fruit is unmarketable. Many of the symptoms associated with mite attacks can be confused with the effects of dry weather or some wilt diseases, but the discolouration of the stem is characteristic of mite infestation and can be used for definite diagnosis.

The tomato mite is extremely small, and although it may occur in large numbers on a plant, it cannot be seen with the naked eye. Therefore growers must be able to recognise the symptoms of injury in order to detect its presence. Under an ordinary hand lens the mites are seen as torpedo-shaped, cream-coloured, slowly moving specks on the stems, leaves or fruit. The eggs are smooth and white, and are laid on the surface of the plant.

The mite occurs on several weeds botanically allied to the tomato, including the green and Cape gooseberries and two varieties of wild black currant. At times it may also be abundant on English potatoes. Infestation spreads quickly through a field of tomatoes, particularly under warm conditions which favour rapid breeding. Carriage by wind appears to be the chief method of dispersal.

Mites are among the simplest of tomato pests to control. Old plants can be a source of infestation of young crops, and therefore should be destroyed when picking has ceased. Weeds which harbour the pest should also be eradicated. Furthermore, it is inadvisable to plant tomatoes near crops of English potatoes or in land from which potatoes have just been harvested.

Complete elimination of sources of infestation is seldom possible, and insecticides must often be used in the field for mite control. Sulphur dusts and sprays give good results. Ground sulphur, or precipitated or sublimed sulphur, diluted with an equal quantity of fine hydrated lime, may be used, at the rate of 5 to 20 lb. per 1,000 plants, depending upon their size. The proportion of sulphur in dusts which are not used exclusively for mite control should be not less than 30 per cent. A spray containing lime sulphur at a strength of 1 gallon of the commercial concentrate to 100 gallons of water, or colloidal sulphur at a strength of 1 lb. to 50 gallons of water is also effective. The amount of spray used will vary with the size of the plants treated, 40 gallons being sufficient for 1,000 plants 1 foot across. Colloidal sulphur may be added to a Bordeaux-lead arsenate combination spray, but on no account should lime sulphur be added to this mixture.

Tomatoes should be treated from the seedling stage onwards in Central and North Queensland, where the mite is particularly important. Sulphur applications should be made once a fortnight, except in mid-winter, when monthly applications are normally adequate. Treatment once a month is usually sufficient in South Queensland; if, however, losses have been experienced in the previous season, more frequent spray or dust applications are desirable.

Jassids.

Numerous small white dots on the older leaves are the first symptom of jassid attack. As injury increases these white dots merge to form larger patches embracing the greater part of the leaf, which then curls and later dies prematurely. Leaf curl may be pronounced in young leaves, but the white spotting is less distinct. Leaf loss begins at the base of the plant and progresses along the stem in a manner similar to that observed in mite injury on tomatoes, but a careful check of the stem and leaf symptoms will prevent any confusion. Fruit may also be attacked, white spots of dead tisue appearing in the skin which is also blemished by dark stains of excreta.

The tomato jassid* is a small green insect about $\frac{1}{6}$ inch in length, possessing wings and sucking mouthparts. It is capable of only limited flight. On shaking an infested bush, a swarm of the winged insects will emerge momentarily. The females lay their elongate eggs within the tissue of the younger parts of the stem and in the leaf petioles. From these emerge the young, which are very similar in appearance to the adults, save that they are smaller and wingless. Like the adults, they usually remain on the undersurfaces of the leaves, where they frequently move with a characteristic side-ways motion. As they grow, they moult several times. During the autumn, eggs hatch in ten to twelve days, the young reaching the adult stage in a further two to three weeks. This rate of development enables jassid populations to increase rapidly under favourable conditions.

Jassids are particularly important in North Queensland, where populations are highest in the late winter and early spring months, most crops having then reached their peak picking period. They are especially abundant after a dry autumn and winter. Young crops planted for late picking soon become infested from old fields, and their commercial bearing period ends prematurely. Injury is generally less severe on well-grown crops. If growth is checked, the pests are particularly destructive, and every attention should therefore be given to the maintenance of good-growing conditions throughout the season. The tomato leafhopper lives on several other plants, including the eggfruit and the potato.

Weekly applications of a 5 per cent. nicotine dust during the warm hours of the day will check the pest, but usually such treatment is too expensive for general use.

Aphids.

Sometimes during cool, cloudy weather, aphids† appear under the leaves of tomatoes, and cluster on the blossoms and young growth. Severe attacks are not uncommon in spring crops grown in South Queensland, where they induce curling in the leaves, distortion or death of shoots, and blossom-fall.

The green, slow-moving aphids on tomatoes are larger than those encountered on many other plants. They suck the sap by means of piercing mouth parts, and can carry and spread virus diseases. The colonies consist of winged and wingless individuals, the relative proportions of which vary with the season. Winged forms can migrate and commence new colonies. Ants are sometimes in attendance, and their activity indicates the presence of aphids.

---

* *Empoasca terra-reginae* Paoli.

† *Macrosiphum solanifolii* Ashm.

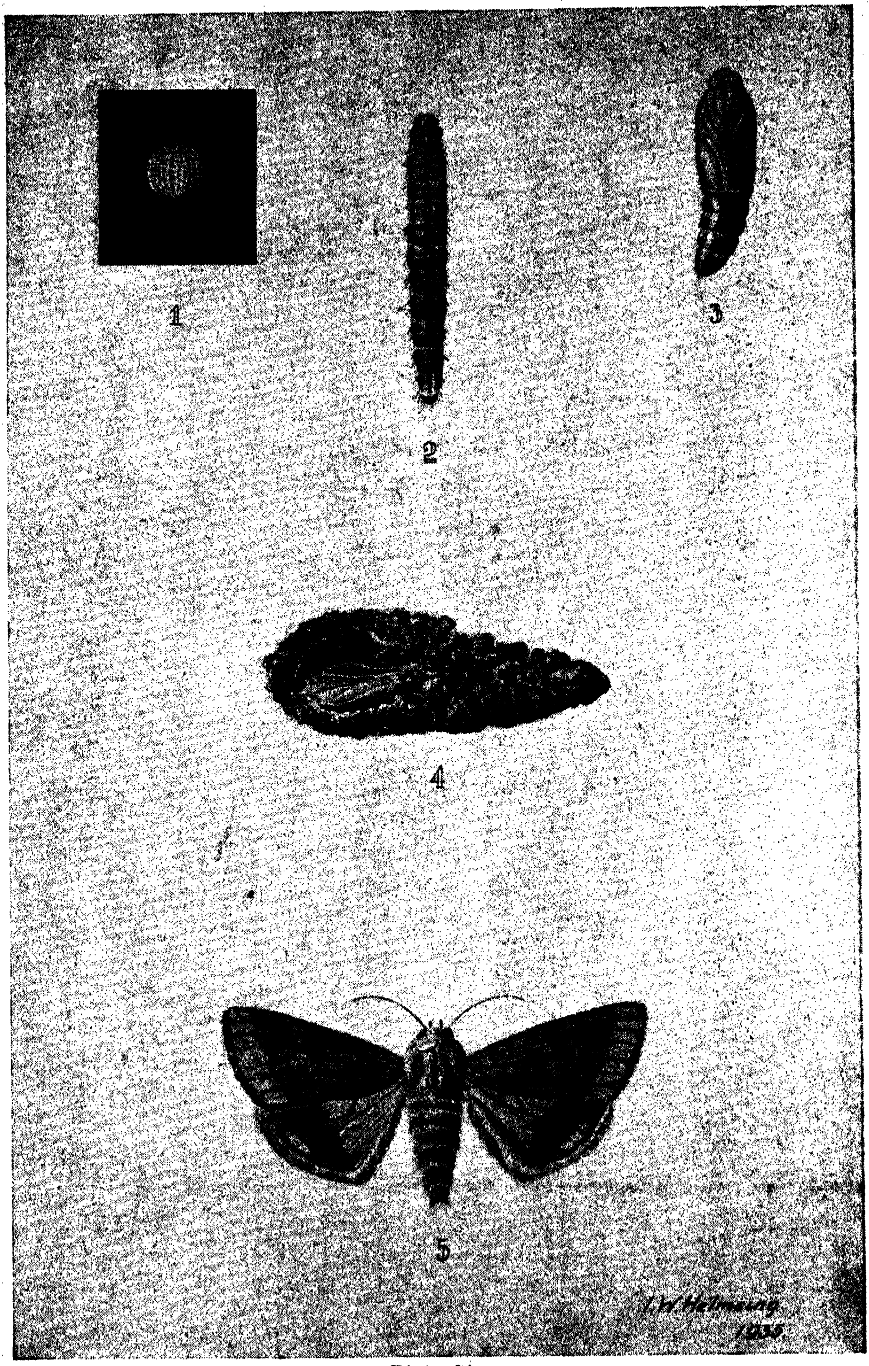


Plate 91.

CORN EAR WORM.

Fig. 1.—Egg × 14.
Fig. 2.—Larva, natural size.
Fig. 3.—Pupa × 1½.
Fig. 4.—Pupa in earthen cell × 1½.
Fig. 5.—Adult × 1½.

Aphids can be controlled by one or more applications of nicotine dusts or sprays. Applications of a 2½ per cent. nicotine dust are adequate for normal requirements. A nicotine spray may be prepared to the following formula:—nicotine sulphate, 1 pint; soft soap, 4 lb.; water, 100 gallons.

Leaf-eating Looper.

Foliage may be eaten by the leaf-eating looper,* a green caterpillar which grows to 1½ inches in length and moves with a looping motion. The adult moth has a wing spread of slightly over 1¼ inches. The forewings are a variegated brown, with two prominent silvery patches in the centre of each, while the hind wings are smoky coloured.

Injury is rarely of importance, except in seedbeds, where lead arsenate dusts or sprays can be applied to control the pest.

FRUIT AND FLOWER PESTS.

Corn Ear Worm.

Corn ear worm† is the most destructive pest of tomatoes in Queensland. Although fruit injury is particularly obvious, blossom damage can also be serious. The caterpillars injure the fruit by piercing the skin and feeding on the fleshy contents. Entrance holes vary in size, being sometimes quite large, though occasionally the small caterpillar enters a half-grown fruit and only emerges when full-grown to pupate in the soil. Unless carefully examined, fruit infested in this way is not detected when packed, and the caterpillar may later eat its way out and attack other fruit in the case. Secondary rots follow, and the fruit may have to be picked over before sale, or discarded altogether. In the field, soft rots usually infect injured fruit, and the flesh inside deteriorates to a watery, slimy consistency. Occasionally, the surface injuries on green tomatoes heal, and the fruit merely shows a superficial blemish. Blossom damage is caused by the feeding of young caterpillars emerging from eggs laid on or near the flowers. These caterpillars may also feed to a limited extent on the foliage, or may make short tunnels in the stems, but these types of injury are of little significance.

The moth (Plate 91, fig. 5) is a stoutly-built, inconspicuously-coloured insect with a wingspread of about 1½ inches. The forewings are greyish-green, often tinted with red; the hindwings are creamy-yellow, with the veins and a broad marginal band smoky. The eggs are laid on all parts of the plant at dusk, the moths remaining among plants during daylight. A female moth may lay as many as 1,000 eggs.

The dome-shaped egg (Plate 91, fig. 1) is cream-coloured when newly-laid, and is about one-sixtieth of an inch in diameter. After an incubation period of three to six days, a small whitish-bodied larva emerges which, when full-grown, is about 1½ inches long and variable in colour, with shades of green, brown, yellow, and red interspersed with black markings. One shade usually predominates, and along each side is a yellowish-white band. The larval stage lasts twelve to twenty-one days in warm weather. When full-grown, the caterpillar (Plate 91, fig. 2) leaves the plant and constructs an earthen cell in the soil, inside which it changes into a dark-brown, smooth pupa (Plate 91, fig. 3),

---

* *Plusia argentifera* Gn.

† *Heliothis armigera* Hbn.

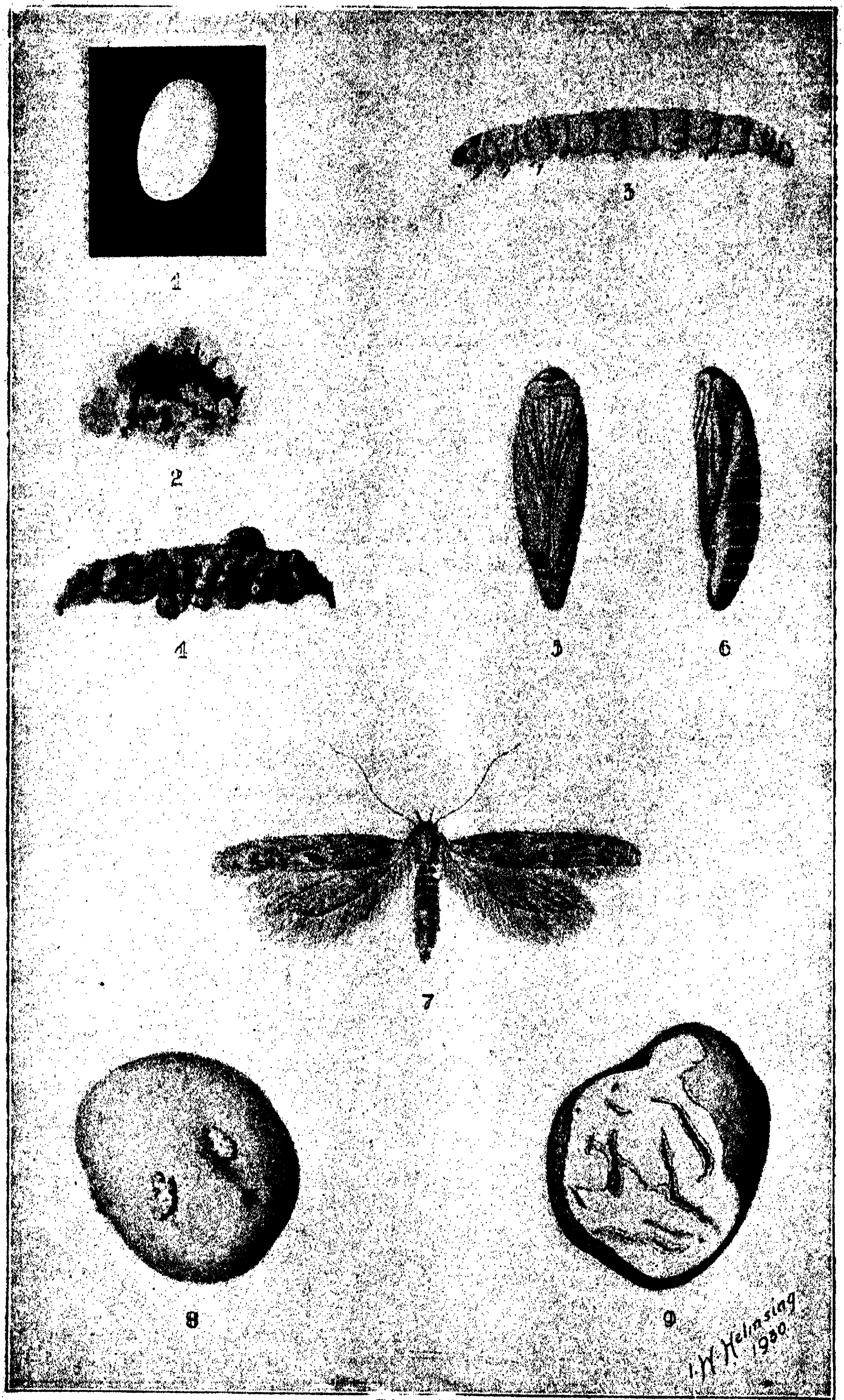


Plate 92.
POTATO TUBER MOTH.

about ¾ inch long. During summer, the adult moth emerges from the pupa after ten to fourteen days.

The corn ear worm feeds on numerous crops and weeds. Apart from tomatoes, crops attacked include maize, sorghum, lucerne, cotton, tobacco, and many vegetables and flowers. The most important weed hosts are gooseberries and pigweeds. Eggs are laid on plants of all ages, but in greater numbers from the commencement of blossoming until the period of peak bearing. As the plants age, eggs are laid much less freely on them.

Proper preparation of the land, weed control, and the destruction of infested fruit, all help to check the pest, but are seldom sufficient to prevent the infestation of tomato crops in coastal areas. Hence these measures must normally be supplemented by applications of insecticides particularly in the warm dry months of autumn and spring.

The most efficient of the available insecticides is lead arsenate, which can be used either as a dust or spray. Dusts are slightly superior to sprays which, though less expensive, are less suitable for use on the larger areas of tomatoes.

The lead arsenate dust should be diluted with an equal quantity of fine hydrated lime or a similar filler before use. It is frequently necessary to control both corn ear worm and tomato mite at the same time, and a composite dust containing lead arsenate five parts, sulphur four parts, and filler one part, is suitable for this purpose. If copper has to be included in the dust for disease control, a mixture containing lead arsenate 10 parts, sulphur six parts, and copper carbonate four parts will be satisfactory.

Where spraying is preferred, lead arsenate may be used at the rate of 3 to 6 lb. per 100 gallons of water. Lead arsenate may be added to a Bordeaux or a Bordeaux-colloidal sulphur mixture to form a combination spray for pests and diseases.

Treatment at intervals of approximately two weeks is required. More frequent applications may be necessary if the plants are growing rapidly, and the pest is very active. Weekly treatments should then be given to the plants. If rain washes the insecticide off within three days after application, the treatment should be repeated. For 1,000 plants 3 feet across, 20 lb. of dust or 120 gallons of spray will be sufficient. Eggs are laid on all parts of the plant, but especially on the young shoots; the latter should, therefore, receive particular attention when insecticides are being applied. Treatment should commence when flowers first appear on the plants.

When marketed, tomatoes must not carry arsenical deposits in excess of ·01 grains of arsenic trioxide per pound of fruit. Ordinarily, the grower wipes his fruit to remove dirt and stains before marketing. This

DESCRIPTION OF PLATE 92.

POTATO TUBER MOTH.

Fig. 1.—Egg × 35.
Fig. 2.—Eggs on tuber surface × 10.
Fig. 3.—Larva, lateral view × 4.
Fig. 4.—Cocoon covered with soil particles × 2½.
Fig. 5.—Pupa, ventral view × 7.
Fig. 6.—Pupa, lateral view × 7.
Fig. 7.—Adult × 4.
Fig. 8.—Tuber showing external signs of infestation, half natural size.
Fig. 9.—Tuber showing tunnelling, half natural size.

procedure, however, is not particularly efficient in removing spray and dust residues which tend to lodge in cracks and furrows on the surface of the fruit.

Chemical treatment is much more efficient, and should be in general use. The method entails the use first of an acid solution and then an alkaline solution for neutralising any acid left on the fruit. The acid dip consists of 1 gallon of commercial hydrochloric acid mixed with 99 gallons of water. The alkaline dip is made by adding 2½ lb. of hydrated lime to 100 gallons of water. The containers used to hold the solutions should be large enough to allow easy manipulation of a suitable wooden case within them, and should be equipped with inclined draining boards. The tomatoes are placed in the wooden case, which should have the boards spaced sufficiently to allow rapid penetration of the solution and quick draining, and immersed in the acid dip for one and a-half minutes, moving the case up and down to wet all the fruit. The case is then withdrawn, allowed to drain on the boards for a few minutes, and plunged into the lime dip for a minute. After removal from this dip, the tomatoes are again drained, well sluiced with clean water, and set aside to dry thoroughly before packing.

Eight gallons of the acid dip is sufficient to treat at least 12 bushels of tomatoes carrying heavy spray residues. Sound and scarred tomatoes, whether coloured or green, are not injured by this treatment, nor is cracked fruit affected, provided it is dried quickly after the dipping process.

Potato Tuber Moth.

Potato tuber moth* attacks all parts of the tomato plant, but fruit injury, due to the larvæ entering at the stem end where they tunnel into the core, is most important. They may also penetrate the fruit where adjacent fruits are in contact or through scars caused by hail, wind, rubbing, and spray burn. Often a web is spun across the entrance hole, making detection of the injury difficult during picking, particularly where the caterpillar has entered at the stem end. One or more caterpillars may be found in each infested fruit. If injured fruits do not decay, they ripen prematurely. Leaves and young shoots may also be attacked, typical symptoms being leaf mining and the collapse of young lateral branches.

The adult moth (Plate 92, fig. 7) is an insignificant greyish-brown insect with a wingspread of just over ½ inch. The very small, oval eggs (Plate 92, fig. 1) are laid at night on all parts of the plant. The full-grown caterpillar is slightly less than ½ inch long, and is dull white, tinged with green. Pupation takes place in white silken cocoons on the plant, in rubbish on the surface of the soil or in crevices around the packing shed. The pupa (Plate 92, figs. 5 and 6) is dark-brown and ⅓ inch long. The life cycle from egg to moth is completed in about one month in warm weather.

Attacks are most severe in the northern parts of the State, particularly during long periods of dry weather, and may continue throughout the entire bearing period of the crop. The pest attacks several other plants, including English potato, tobacco, egg fruit, and Cape gooseberry.

If potato-tuber moth is known to be present, great care must be exercised when packing to cull injured fruit. Infested tomatoes should be collected and destroyed. Crop residues should be removed and

* *Phthorimaea operculella* Zell.

burnt as soon as harvesting is completed. Tomatoes should not be planted on old potato land nor should they be grown near English potatoes, especially if the latter crop is to be harvested before the main tomato picking period. Insecticides are seldom applied solely for the control of this pest; the dusting or spraying programme adopted for corn ear worm control ordinarily holds the insect in check.

Fruit Flies.

Fly maggots are commonly found in rotting tomatoes, and are sometimes suspected of causing fruit losses. This is rarely the case, because most flies bred from tomatoes have entered through injuries due to other causes. These secondary rot flies include a small metallic green species,* a small reddish-brown species,† and several species of grey, hairy flies.‡ In general, the female lays eggs or maggots in cracks, blemishes, or other places where the skin of the fruit has been broken. The full-grown maggots are dull white or creamy in colour, and live for some days in rotting fruit before pupating in reddish-brown pupal cases in the soil.

The true fruit flies§ are brilliant maroon and yellow-coloured insects. Normally, they are of little or no importance to the tomato-grower, but in some years, usually when other crops are being attacked severely, tomatoes also suffer. Unlike the secondary rot flies, the true fruit flies attack perfectly sound fruit.

Insecticides are of no value for the secondary rot flies. These insects only accelerate the normal process of decay, and when losses occur, cultural methods should be examined with a view to eliminating the injuries which facilitate attacks. When the true fruit flies are involved, the losses may be minimised by applying a bait spray to some of the plants. Suitable bait sprays are (*a*) sodium fluosilicate 1 oz., sugar 2 lb., water 4 gallons; and (*b*) lead arsenate 2½ oz., sugar 2 lb., water 4 gallons. One or other of these bait sprays should be applied to about every tenth plant through a course jet spray. More than one application may be necessary.

Green Vegetable Bug and other Shield Bugs.

The shield bugs which attack tomatoes include the green vegetable bug‖ and two smaller insects. The main injury is to the fruit. Both adults and nymphs of shield bugs possess piercing mouth parts through which sap is sucked from the plant tissues. Damaged fruit is mottled and shows white spots, each of which represents a bug puncture. The white spot may extend through the skin and outer rim of flesh. Injured fruit fails to colour evenly, is unpalatable and frequently unmarketable, owing to its abnormal shape and texture.

The adult green vegetable bug measures ½ inch in length by ⅓ inch in breadth, and is green in warm weather but dark brownish-grey in winter. The female lays cylindrical cup-shaped eggs about $\frac{1}{16}$ inch in height under leaves, in batches of 20 to 150. The eggs are at first pale-yellow but change to reddish-brown before hatching. The incubation period is less than a week, and the small newly-emerged nymphs

* *Lonchaea aurea* Macq.

† *Drosophila* sp.

‡ Fam. Muscidae. Fam. Sarcophagidae.

§ *Strumeta tryoni* Frogg. *Austrodacus cucumis* Fr. *Strumeta dorsalis* Hend.

‖ *Nezara viridula* L.

are wingless and bright-orange in colour. They remain near the egg shells for a few days and then scatter over the plant, but are particularly attracted to the fruit. In a few days the nymphs become conspicuously marked with black, green, yellow, and red markings, and after moulting several times reach the adult stage some weeks later.

Both the smaller shield bugs are $\frac{3}{10}$ inch long and about $\frac{1}{8}$ inch wide and have a similar life history to that of the green vegetable bug. One species* is uniformly green with a small horn on each side of the front part of the shield. In the other,† the horns are absent, the head, thorax, and the backwardly pointing wedgeshaped part of the shield are green, while the rest of the body is brown with a greenish tinge.

Some benefit may be obtained if any unparasitised egg masses, nymphs, and adults seen during fruit picking are crushed by hand. If the eggs are black or almost black in colour they are invariably parasitised, and should not be destroyed.

Control by insecticides is unsatisfactory, particularly in large, leafy, untrellised vines, because the bugs cluster on fruit which is well sheltered and protected by foliage. A spray composed of resin 10 lb., caustic soda 2 lb., fish oil 3 lb., and water 40 gallons has given fair results against young bugs. The caustic soda is dissolved in 2 gallons of water and quietly boiled. The finely-ground resin is stirred slowly into this, and the boiling continued until the solution under the surface scum, though dark, is clear. The fish oil is added, and the mixture boiled for a few more minutes. This concentrate is diluted with 38 gallons of water before use. The concentrate containing fish oil does not store well. Hence, if storage is necessary, a concentrate without fish oil should be prepared. After reheating add the oil, boil for a few minutes, and then the spray is ready for dilution and immediate use.

A derris spray containing ·02 per cent. ether extractives prepared from powdered derris-soap or liquid derris proprietary products is also of some value against nymphs. This concentration is about twice as great as that used against thrips. Weekly applications of a dust containing 5 per cent. nicotine will kill some of the young bugs, and exert a deterrent effect against the adults, but as the dust needs to be liberally and frequently applied, its use is costly.

Rutherglen Bug.

Rutherglen bug‡ injury is confined mainly to the fruit, though all parts of the plant may suffer when the infestation is heavy. The blemishes are similar to those caused by shield bugs.

The adult is a greyish-brown, slender, winged insect, about $\frac{1}{6}$ inch long, possessing sucking mouth parts. It flies actively on warm days when disturbed. The eggs are small, elongate, and white when newly-laid, and are commonly found in the hairy seed heads of thistles, ragweeds, and around the buds and flowers of red pigweed. The eggs hatch in about six days in warm weather, the wingless, reddish-brown nymphs reaching the adult stage in a further three weeks. The pest population on tomatoes consists of invading swarms of adults and occasionally nymphs, since Rutherglen bug does not breed on this crop.

* *Cuspicona simplex* Walk.

†* *Plautia affinis* Dall.

‡ *Nysius vinitor* Berg.

Rutherglen bug infests many crops other than tomatoes. Attacks are likely when dry weather follows late winter or early spring rains, which favour the growth of weeds. Heavy rains, which stimulate fresh weed growth, often scatter large swarms.

Constant control of weeds within and around fields should be maintained as far as practicable. Bugs on infested weeds may be destroyed by applications of a calcium cyanide dust, or by spraying with crude oil emulsion or kerosene emulsion at a strength of one part to eight parts of water. Temporary relief may be given to an infested field by lighting smoke fires.

Control by insecticides is not satisfactory, because the bugs fly quickly, and many escape contact with sprays or dusts. Either a dust mixture containing equal quantities of pyrethrum and a 3 per cent. nicotine dust or a spray of 3 lb. pyrethrum powder, 2 lb. soft soap, and 50 gallons water used immediately after preparation may give some relief if several applications are made when the bugs are numerous.

Thrips.

Blossom-fall in tomatoes may be due to a number of factors, but in North Queensland, high thrips* populations are a probable cause of faulty fruit setting, particularly in dry weather. Thrips are very small, active, cream-coloured insects, about $\frac{1}{16}$ inch in length. The thrips cluster inside the flowers, which subsequently fall. Fruit developing after such outbreaks is frequently mis-shapen.

If high thrips populations are observed in the tomato flowers and flower drop, with or without fruit malformation, has previously been reported on the farm, it is suggested that a 5 per cent. nicotine dust be used. More than one application may be necessary to check the pest.

ROUTINE PEST CONTROL MEASURES.

The thorough cultural operations which are essential for the tomato crop also reduce the risks of pest infestation. In this connection the following points are important:—

1. For planting material, use only healthy seedlings, with roots free from nematode nodules.
2. Maintain good-growing conditions in the field by frequent cultivation both before and after transplanting, by the use of fertilizers and by judicious watering when irrigation facilities are available.
3. Collect and destroy all damaged fruit.
4. Exercise care in packing tomatoes in order to avoid the inclusion of fruit infested with pests which may later be the means of spoiling the remainder of the case.
5. Plough out old tomato plants immediately after picking has ceased and burn them if they are infested with nematodes.
6. Do not plant tomatoes after potatoes or near crops subject to attacks by tomato pests.

Growers are seldom faced with a simple problem such as the control of a single pest. For economy in labour and material, therefore, a basic programme which will control pests likely to occur in the crop

* *Frankliniella* sp.

must be adopted, reserving applications of special insecticides for special problems. The requirements of disease control must also be considered. Combined insecticidal and fungicidal treatments are required in the seed bed and the field.

In the seed bed, light but frequent applications of a dust containing arsenate of lead 5 parts, sulphur 6 parts, copper carbonate 3 parts, and filler 6 parts will ensure seedling growth free from most pests and diseases. A proprietary dust of this kind would carry an analysis as follows:—7·75 per cent. arsenic pentoxide (As_2O_5) as lead arsenate, 30 per cent. sulphur as ground (or precipitated or sublimed) sulphur, 7·5 per cent. copper (Cu) as copper carbonate. A combination spray consisting of 2-3-40 Bordeaux (or 1 in 20 cuprous oxide mixture) with colloidal sulphur (1 lb. to 50 gallons) and lead arsenate (1 lb. to 50 gallons) will achieve the same purpose. If aphids appear, they should be treated with a 2½ per cent. nicotine dust or a nicotine spray (1 pint nicotine sulphate, 4 lb. soap, and 100 gallons water).

In the field, an all-purpose dust mixture should contain lead arsenate 10 parts, sulphur 6 parts, and copper carbonate 4 parts. Such a proprietary dust would carry the following analysis:—15·5 per cent. arsenic pentoxide (As_2O_5) as arsenate of lead; 30 per cent. sulphur as ground (or precipitated or sublimed) sulphur; 10 per cent. copper (Cu) as copper carbonate. If desired, a combination spray of 4-4-40 Bordeaux (or 1 in 10 cuprous oxide mixture), to which lead arsenate 3-6 lb. and colloidal sulphur 2 lb. are added to each 100 gallons of the spray may be used. A nicotine dust or spray similar to that used in the seed beds should be applied if aphids become numerous. Treatment in the field should commence when flowering begins and continue at approximately fortnightly intervals at least until picking tallies are at their maximum.

Mixed dusts containing insecticides and fungicides in similar proportions to those stated in the recommended formulæ are prepared by several firms. Although mixing on the farm cheapens the cost, it is preferable for the grower to purchase dust mixtures already prepared, unless he has facilities for accurately weighing the ingredients and thoroughly mixing them.

CHEESE FLAVOUR PHOTOGRAPHED.

Wonders, of course, will never cease! Cheese flavour has had its picture taken for the first time. Science workers are now using X-rays to photograph the flavour of cheese. They want to find out what gives cheese its appetising taste.

Flavour is one of the best things about meal time. Physiologists and psychologists point out that food must be palatable to be eaten in quantity and to be digested properly. A monotonous menu may upset any normal digestion. The careful choice and application of flavour—and every good cook knows this—is important in relieving this monotony. Flavour needn't be a luxury, but it may be provided in daily meals by everyday foods, such as cheese. With a large selection of 400 varieties, each with a different agreeable flavour, cheese makes an outstanding contribution to our dairly bills of fare.

The high nutritive value of cheese, as well as its usefulness in economical meal-planning, are other reasons for including cheese in our daily rations. Experiments have shown that cheese is nearly 100 per cent. digestible. That is another top mark for our dairy industry. There is this about cheese, too—there is little or no waste in preparing it for the table. For an appetising combination, just think of cheese and spring onions!

Fodder Conservation in Queensland.

I. SILAGE AND SILOS.

C. J. McKEON, Director of Agriculture.

The making of silage is not a complicated process calling for considerable skill and experience. The reverse is the case, less skill and experience being required than for the making of good hay. Furthermore, the best quality silage can be made during weather conditions which would make the curing of hay impossible. Once a crop has reached the correct stage for converting into silage a start can be made regardless of the weather and, providing a few simple rules are observed, silage of good quality can be made by anyone who has had no previous experience.

A silo is a definite asset on any farm, and it is doubtful if the outlay involved could be expended on any other improvement with greater financial benefit. The increased butter production alone resulting when dairy cows are fed on silage during the winter months of normal seasons would soon compensate for the expenditure involved. In addition, a well-filled silo would be the means of saving at least a portion of a herd during drought periods, when the cost of fodder precludes its purchase by many stockowners.

ALTHOUGH conservation of fodder in the form of silage has been practised in Queensland for many years, the total quantity stored annually in this way has been far below ordinary winter requirements, apart altogether from the drought reserves which should, as a matter of prudence, be stored in seasons of abundance. Soil and climatic conditions throughout the agricultural districts are generally very favourable for the production of many summer fodder crops, which provide a great bulk of material suitable for silage making. Hence, if full advantage were taken of the bounty of nature in this regard, stock losses during seasons of scarcity would be greatly reduced. In addition to its drought insurance value, however, silage provides a succulent and nutritious stock food during the winter months, when natural pastures are usually dry, unpalatable, and lacking in nutritive value. It has been proved that the feeding value of silage is little, if at all, inferior to that of the green material from which it was made, and this, coupled with the fact that its succulence and laxative properties promote a better functioning of the digestive system than dry feed, makes it a very valuable fodder.

Winter rainfall is usually unreliable in most districts in this State; consequently the planting of seasonal crops for grazing purposes cannot

be undertaken with any certainty that they will provide sufficient food to enable stock to winter well. Summer fodder crops, however, can be sown with far greater confidence, and from them a much greater bulk of green material can be produced.

During the early years of the development of dairy farming in Queensland, especially on the fertile soils of the rain-forest districts, the growth of sown pastures was so luxuriant that the need for fodder conservation was not felt. The rate of stocking was then considerably higher than that of later years. The gradual decline in the carrying capacity of even the richest lands through the lowering of soil fertility, through soil impaction caused by heavy stocking, and through the old swards becoming root-bound has since made fodder conservation a necessity in the majority of holdings in every dairying district.

The same serious reduction in carrying capacity has also occurred in native pastures largely as a result of over-stocking. The stock naturally show a preference for the more nutritious and more palatable native grasses, with the result that they have been kept in a closely-grazed condition and been prevented from seeding. The inferior species have been neglected to a large extent, and, consequently, have seeded freely and ultimately predominated in some cases.

For the reasons just given, a silo is really a necessity on most properties in agricultural areas. It is a very definite asset, and it is doubtful if the outlay involved could be expended on any other improvement with greater financial benefit. The increased butter production alone resulting when dairy cows are fed on silage during the winter months of normal seasons would soon compensate for the expenditure involved. In addition, a well-filled silo would be the means of saving at least a portion of a herd during drought periods, when the cost of fodder precludes its purchase by many stockowners.

Admittedly many are not in a financial position to build the more costly types of silo, but if it were more widely appreciated how effectively and cheaply silage can be conserved in the less costly silos it would be used to a much greater extent than it is at present.

The making of silage is not a complicated process calling for considerable skill and experience. The reverse is the case, less skill and experience being required than for the making of good hay. Furthermore, the best quality silage can be made during weather conditions which would make the curing of hay impossible. Once a crop has reached the correct stage for converting into silage a start can be made regardless of the weather and, providing a few simple rules are observed, silage of good quality can be made by anyone who has had no previous experience.

THE MAKING OF SILAGE.

Good quality silage can be made only from material which has been cut and stored in a fresh, green state, the aim being to conserve the fodder in a succulent condition. This is brought about by acid fermentation which occurs when the air is excluded from the mass; consequently, the quality of the silage will be very largely influenced by the extent to which the air has been expelled and excluded from the material. It is therefore necessary that the silo be as airtight as possible.

The best quality silage is that known as "acid" silage, which is light-brown to yellow-brown in colour and possesses a distinctly pleasant

acid smell—hence the name. Silage of this kind can be made only from suitable types of crops, and then only when these have been cut at the right stage of growth and handled in the correct manner. If crops have been allowed to reach an advanced stage of maturity, or if they have been allowed to dry out in the field after being cut, normal fermentation will not occur, moulds will develop, and an inferior silage, known as "mouldy" or "musty" silage, will be the result. Crops which would otherwise be suitable, but which have been cut when very immature, or which are naturally of a very soft succulent nature, also make an inferior silage when used alone, for the soft, sappy material packs so closely that little heating takes place. Silage made under these conditions possesses an objectionable smell and is known as "sour" silage. Immature material or material of too succulent a nature may be used, however, to advantage by blending with material of a coarse and more fibrous nature, such as maize or sorghum. The proportions in which it should be blended, with either of the latter crops, depend upon its degree of immaturity or succulence, but, as a general rule, it should not be mixed in more than equal proportions.

The material should be cut when in a green, but not immature, stage, and should be carted from the field and placed in a silo as soon as possible after being cut. On no account should it be allowed to lie in the hot sun and become badly wilted. Should this occur for some unavoidable reason, it is advisable to sprinkle the material with water as it is being conveyed to the silo from the cutter. If, however, the quantity of material so affected is large, it should be mixed in equal proportions with freshly-cut material when being stored, and, if necessary, also sprinkled with water.

Silage which has been properly made will keep for many years without deteriorating in any way if stored under airtight conditions. It is not damaged in any way by insects or vermin, nor is there any risk of loss by fire as is the case with hay.

THE FEEDING OF SILAGE.

If required, silage may be fed from eight to ten weeks after being made. Stock quickly acquire a taste for it and greatly relish silage, and rarely is any trouble experienced in getting them accustomed to it. When it is intended to feed it to dairy cows that have not previously had silage, it is a good practice to place a small quantity in feed boxes at the head of each bail for a few days before commencing regular feeding. When this is done, the cows almost invariably acquire a taste for it within a few days.

Silage is not only a nutritious and palatable food for dairy cows but it is also excellent for sheep, and, during winter months or dry periods, it is of particular value for breeding ewes. It is not generally regarded as being suitable for horses; they will eat it, but it should be fed sparingly to them.

It is advisable to commence feeding a small ration, gradually increasing the quantity until the full ration is being fed. This particularly applies to stock which have been on dry feed and which are likely to be affected by scouring if a full ration were fed from the commencement. The amount of silage to be fed daily is governed by the weight of the animal and the quantity and quality of milk produced, in the case of dairy cattle, as well as by the amount of natural feed available.

Silage made from crops such as maize and sorghum, which are those most widely used for this purpose, contains a high proportion of carbohydrates, but it does not contain sufficient protein to constitute a balanced ration. Therefore, when fed to dairy cows with a view to maintaining or increasing milk production, silage should be supplemented by protein rich food, such as lucerne, cowpea, field pea, seed cake preparations, and meat meals.

SUITABLE SILAGE CROPS.

The best silage is made from crops with a high sugar concentration, as these form sufficient acid to ensure the desired state of preservation. Legumes are unsuitable for silage-making alone unless strong preserving acid or fermenting molasses is added. As a general rule, these crops are better conserved as hay. The chief crops produced in Queensland for silage purposes possess the desired sugar content and, in addition, produce a large quantity of green material.

Maize is the most popular and also the most suitable of all crops for silage purposes. To facilitate harvesting and also to promote good cob growth, it should be sown in rows just sufficiently wide to permit of inter-row cultivation. It may also be spaced closer in the rows than when the crop is grown for grain. The crop should be cut when the grain is well formed but before it has commenced to harden. The ideal stage is when the grain reaches the late dough stage. The cheapest and most efficient method of harvesting maize for silage-making is with a maize binder, but few of these very efficient labour-saving machines are now to be seen and the crop is usually harvested by hand, using a cane knife or other suitable tool.

Improved Yellow Dent, also known as Fitzroy, Golden Beauty, and Star Leaming are varieties which can be recommended as silage crops. The first mentioned is suitable only for coastal districts where the rainfall is generous and reliable, whereas the other two varieties can be

Plate 93.

SACCHARINE SORGHUM CROP SUITABLE FOR SILAGE.

grown both on the coast and inland. On good soils and under favourable seasonal conditions, yields of from 12 to 15 tons of green material to the acre may be expected.

Sorghums (Plate 93) are next in favour for silage-making and are particularly suitable for districts in which the rainfall is light or unreliable. They can also be grown successfully on poorer types of soil, which are not suitable for maize. The saccharine types are recommended in preference to the grain types, as the stalks of the latter are of a pithy nature and have a low sugar content.

The commonest practice is to sow these silage sorghums broadcast, but many arguments can be advanced in favour of sowing them in rows, spaced either just wide enough apart to permit of inter-row cultivation or sufficiently close to enable the plants to suppress weed growth. When the closer spacing is adopted, a seed drill should be used for sowing the seed, and a very satisfactory row spacing can be attained by blocking every second grain run, thus spacing the drills 14 inches apart.

Crops sown in rows are handled with greater ease and celerity and are less likely to lodge and become a tangled mass than when sown broadcast. This is particularly important when the full length stalks are to be used, as in trench silos and stack silage, because bent and twisted stalks cannot be stored so compactly as straight stalked material. The crop should be cut when the grain is in the same condition as that recommended for maize silage. The same methods of cutting the crop are also usually adopted.

The most widely-grown varieties are Imphee or Planter's Friend, Saccaline, and Honey. Other varieties are White African, Sugardrip, Orange, Italian, Colman, and Sumac. Under favourable conditions, yields of up to 20 tons to the acre may be expected, and this figure may be exceeded under very favourable conditions.

Sudan grass also makes excellent silage and is a crop which is particularly suitable for inland districts. It may be used alone or in conjunction with the coarser stalked crops, such as maize. When made into silage with full length maize stalks in either trenches or stacks, the fine stalks of the Sudan grass pack closely between the coarser maize stalks, thereby assisting in expelling the air as the mass of material settles.

If available, a seed drill should be used for sowing Sudan grass, but, if not, the seed should be sown broadcast. The best method of cutting the crop is with an ordinary reaper and binder, as material so cut is more easily handled, both in the field and when being placed in the silo, than crops which are cut with a horse mower. The correct stage for cutting is when the grain is just forming. Given favourable weather conditions, two or more cuttings of Sudan grass may be expected. From a well-grown crop a first cut of 8 to 10 tons of green material to the acre may be produced. Any subsequent cutting is usually much lighter.

White panicum and Japanese millet, which are fairly extensively grown for hay and grazing, are also of considerable value for silage-making, being converted into silage either alone or as a mixture with maize or sorghum. They can be grown successfully on a fairly large range of soils but are not so well suited to such districts as the Darling Downs and the Maranoa as is Sudan grass. For coastal districts the

reverse is the case. They are sown and cut in the same way as Sudan grass, but the yields of green fodder are somewhat lighter. Cutting should be carried out before the grain has developed. They are free seeders and shed their seed readily and should, therefore, not be allowed to produce mature seed; otherwise a considerable amount of trouble will be experienced in dealing with the volunteer growth which will appear the following season.

The foregoing crops are the most widely grown and also the most suitable for silage purposes, but, in addition, other summer-growing crops, such as cow cane and elephant grass, produce a great bulk of fodder and may be successfully used if cut before the stalks become too woody, particularly if a light-stalked crop is mixed with them. Pasture grasses, such as paspalum and Rhodes grass and others of a similar habit of growth, may also be cut for silage, but when these are being used alone., i.e., not as a mixture with heavier-stalked crops, they should be cut when in a fairly mature, but not dry, stage, and on no account should they be used for silage in a young stage. If this were done, the best that could be expected would be sour silage, and very often the resultant material would turn out an almost worthless sodden mass.

Legumes such as lucerne, Poona, Black, and Groit cowpeas are rarely used alone in Queensland for silage-making but are frequently mixed with non-leguminous crops, thereby increasing the feeding value of the silage. Lucerne is easily cut and handled and presents no difficulties in this respect, but owing to their habit of growth, cowpeas are much more difficult to cut and handle, and, consequently, they are not used to the extent they might otherwise be. Some success has been met with when cowpeas and maize or sorghum have been grown together, but such a combined crop is usually difficult to handle, and furthermore, a heavier yield is generally obtained when the two crops are grown separately. Nevertheless, a combination of Groit cowpea and maize has proved promising on the Atherton Tableland. A light sowing of the cowpeas can be made, the seed being sown in the same drills and at the same time as the maize. 'No general recommendation can be made regarding cowpea varieties for silage, as soil fertility and seasonal conditions have such a marked influence on the growth and period of maturity. The aim should be to select a variety of cowpea that will produce the desired amount of foliage and reach the correct stage for cutting at the same time as the maize. It should not, however, be a variety which will produce a crop of vines sufficiently heavy to restrict the growth of the maize or weigh the plants down and thus add to the cutting and handling costs.

Winter-growing crops which may be used for silage-making are wheat, barley, oats, and field pea. Florence wheat and Dun field pea, when sown together at the rate of 40 lb. of the former and 20 lb. of the latter to the acre, provide an excellent mixture, as both crops reach the correct stage for cutting, i.e., the flowering stage, at the same time. Other winter cereals, when sown in conjunction with field pea, also give very good results. The growing of winter crops cannot be undertaken with the same degree of certainty as in the case of summer crops, nor are their yields of green material comparable with those from summer crops, such as maize or sorghum. Hence the growing of these or other suitable summer crops, in preference to winter crops, is recommended.

TOWER SILO.

The reinforced concrete tower silo (Plate 94) is usually the most costly type to construct, and, in addition, a more expensive plant is required to fill it than is necessary for an underground silo. The points in favour of the tower silo, however, outweigh those objections, and for anyone who is in a financial position to build one, this type of silo is strongly recommended. If properly constructed it is practically everlasting.

Plate 94.
REINFORCED CONCRETE TWIN TOWER SILO.

The best results are obtained when the silo has been so constructed that the height is considerably greater than the diameter, thereby ensuring sufficient pressure to consolidate the materials properly. The usual practice is to make the height of the silo approximately double the diameter of the silo, e.g., a silo 14 feet in diameter should be 28 feet in height. Should it be desired to reduce the height of the silo above ground, this can be done by excavating and building a portion underground. The cost of construction varies very considerably, and is influenced largely by the distance that materials, particularly sand and metal or river gravel, have to be carted and the amount of outside labour required.

In addition to an engine and cutter, which is required for chaffing the material to be converted into silage, either a blower or an elevator is necessary to convey the chaffed material to the silo. The latter calls for additional power, and an engine of at least 5 horse-power is required to drive the cutter and at the same time provide the necessary power to work the blower or elevator.

Filling the Tower Silo.

During the whole time filling operations are in progress one person should be stationed inside the silo to keep the chaffed material evenly distributed and well trampled, paying particular attention to the material adjacent to the wall. As the chaffed material is falling from

the top of the silo, the heavier particles drop in the centre, and the light, leafy portions drift towards the wall. It is therefore essential that constant attention be paid to the even distribution of the material. On no account should this be done at lengthy intervals, as it will not then be possible to get an even mixing, with the result that an uneven consolidation will occur and the quality of the silage will be adversely affected.

As a greater settling occurs in the centre of the silo than elsewhere, it is advisable to keep the material slightly higher in the centre. When filling has ceased for the day, all who are assisting with the work should enter the silo and thoroughly trample the material. Filling should be continued each day until the silo has been filled. Should operations be unavoidably held up, the top layers of material will quickly deteriorate if left exposed to the air, and should it be evident that any more than a few days will elapse before it will be possible to resume filling operations, it is advisable to cover the material with a layer, several inches in depth, of finely-chopped succulent grass or something equally suitable. The covering layer should be removed immediately prior to filling being resumed, care being taken to see that no material showing signs of mould is left. The same care is necessary where a protective covering has not been used, as it will then be necessary to remove the top layers of the material which is being converted into silage and which have become dry or are showing signs of moulds.

When the silo has been filled, a layer of approximately 12 inches in depth of some fine-stalked, succulent material should then be added and spread evenly over the surface as soon as possible. When well trampled, this forms a dense, mouldy mass and prevents the entry of air. When suitable green material is not available, wet chaff may be used.

Weighting material is of great assistance in bringing about the desired consolidation of the top few feet of material, but it is not an easy matter to convey the required amount of earth or stones to the top of the silo and, rather than do so, many prefer to devote more time to the trampling of the top few feet of silage and also of the material which is used as a protective covering.

Emptying the Tower Silo.

When it is intended to commence feeding the silage to stock, the covering material and with it the top layer of silage which has been in contact with the mass of mouldy covering material should be removed. If the material has been thoroughly trampled, the quantity of silage which has become mouldy will be negligible, and usually the removal of a layer an inch or two in depth is all that is necessary. Silage deteriorates when exposed to the air for any length of time, and each day's requirements should be taken from the whole of the surface to a depth of at least 2 inches. This prevents any remaining exposed for more than twenty-four hours. An ordinary garden rake is very suitable for removing the silage, as the surface can be maintained in an even condition and the layer below is not disturbed, as would be the case were a fork or other long-pronged tool used.

So little time is required each day in removing and replacing a cover that the use of one is recommended. This can be made from canvas or any other suitable material, and will assist very materially in keeping the silage in a succulent condition.

CIRCULAR PIT SILO.

The circular pit silo (Plate 95) is becoming increasingly popular, and during recent years a very large number have been constructed. Providing a suitable site is available, it is not necessary to concrete the whole of the silo, and in such a case all that is required is a concrete collar 4 inches in width and 5 feet 6 inches in depth. The usual practice is to have portion of the collar projecting above ground level, and thus all risk of storm water finding its way into the silo is eliminated and considerable protection is afforded against accident to human beings and straying stock. The collar type of circular pit silo would be unsatisfactory in many locations and, in such cases, it will be necessary for the whole of the pit to be concrete lined.

Plate 95.
CIRCULAR PIT SILO SHOWING CONCRETE COLLAR AND SLIDING ROOF.

It is essential that the wall of the collar type of circular pit silo be kept plumb, and also that, below the collar, it be smoothly trimmed to ensure even settling of the material. Cavities in the wall will be the means of causing the silage adjacent to them to become mouldy or of inferior quality. By using an iron rod and batten, no difficulty should be experienced in keeping the wall plumb.

Providing the silo has been properly constructed on a site where there is no danger from water seepage, silage of the best quality can be made in the collar type of circular pit silo and kept for many years in splendid condition. The concrete collar type of circular pit silo can be more cheaply constructed than either the tower type or the completely concrete-lined circular pit silo, and the additional saving of the cost of a blower or elevator is effected, as compared with the tower type. The completely concrete-lined circular pit silo costs about the same as the tower silo, but here again the cost of a blower or elevator has not to be incurred. The removal of the silage from either type of circular pit silo, however, requires a little more time and labour than is the case with a tower silo, but for those who do not feel disposed to construct the latter type, the pit can be recommended as an efficient substitute.

Filling the Pit Silo.

The same methods should be adopted in every detail in filling a circular pit silo as when filling a tower silo. Weighting material to provide additional pressure may be applied with less inconvenience to the pit than to the tower silo. Furthermore, as the pit silo is covered either by a high shed or a low sliding roof, it is possible to thoroughly trample the material at a higher level in the silo than is the case with the tower silo, which of necessity has a fixed roof with little clearance between the top of the silo and the lowest portion of the roof.

Emptying the Pit Silo.

A hoist is necessary for the removal of the silage. The type of hoist, together with the self-emptying drum, which is recommended for use when excavating the pit (Plate 101) has also proved highly satisfactory for the removal of the silage, and can be very cheaply constructed. The silage should be collected for removal in the same way as in the tower silo, and the same precautions should be adopted to keep the silage in a fresh, succulent condition.

TRENCH SILO.

Plate 96.
EXCAVATING A TRENCH SILO.

The trench silo (Plate 96) is a cheap and very efficient type, and is particularly suitable for inland districts where prolonged rainy periods are not generally experienced, and consequently the risk of seepage water gaining access to the trench is slight. Care is necessary in selecting a site, and one in which seepage is likely to occur should be avoided. The only cost involved in constructing a trench silo is for labour, and when the usual practice of excavating by means of a plough and scoop is adopted, the cost is small. Under normal conditions, and with a suitable plant, two men can excavate a trench of at least 50 tons capacity in two or three days. The excavation is usually 10 feet wide, approximately 8 feet deep, and whatever length is necessary to accommodate the material to be made into silage. The ends are sloped sufficiently to permit of the trucks or wagons being driven through the trench when unloading. The sides should be trimmed as evenly and as smoothly as possible. If logs are

available, these should be laid along each side of the trench and the excavated earth banked over them to a height of approximately 2 feet. A gradual taper away from the trench should be allowed to prevent storm water gaining entry to the silage.

Filling the Trench Silo.

The material in a trench silo is usually made into silage in a whole or unchaffed state, and, in doing so, care should be taken to lay the stalks in one direction only. This applies particularly to thick, long-stalked crops, such as maize or sorghum, as the best results cannot be obtained with them when too much air is admitted as a result of careless spreading or laying the material in transverse layers. It should be spread in even layers, lengthwise along the trench.

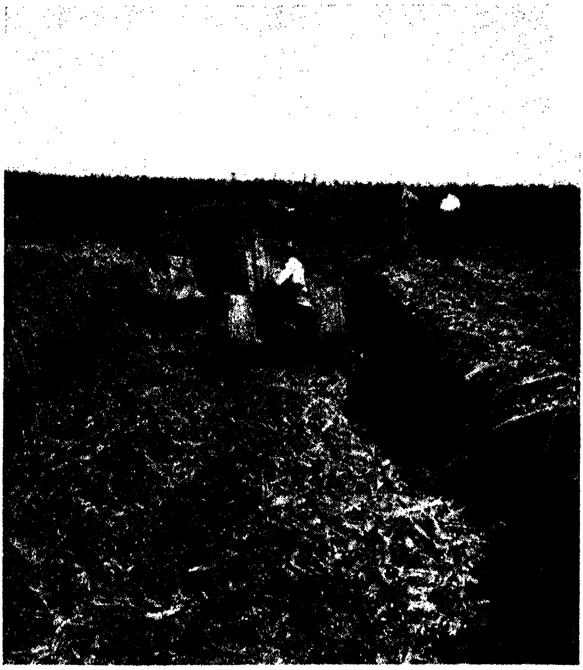


Plate 97.

PARTLY-FILLED TRENCH SILO SHOWING TRACTOR CONSOLIDATING THE MATERIAL.

The truck or wagon may be driven through the trench as each load is being spread. This allows the material to be handled more easily and more expeditiously than if it were unloaded from the side of the trench, and it also consolidates the silage. Filling (Plate 97) should be continued until the material is well above the top of the trench to allow for subsidence. Should the material be likely to subside to such an extent that more is required, this may be added a week or ten days later. In the interval, a covering of green grass should be provided to prevent the formation of mould on the top layer. When the trench has been filled, a thick layer of green grass should be spread over the top of the silage material, and this in turn should be covered by earth excavated from the trench. The earth covering should be formed in such a manner that when the silage material has completely subsided there will be sufficient camber to turn rain water away from the trench.

Emptying the Trench Silo.

The silage should be removed from one end of the trench, and only that section of the covering material which will allow the required amount of silage to be removed should be disturbed. A sharp hay knife or broad axe is very suitable for the cutting of the silage. It should be removed in vertical sections, thus exposing the minimum amount of silage to the air.

STACK SILAGE.

Silage may be easily and cheaply conserved in stacks, but this method is only recommended when the silage is to be used within a few months after being made. Even when most carefully built, exposure to the atmosphere causes wastage on the sides and ends of the stack, and this increases with time. The stack should be erected in a well-drained situation, and in a position handy for feeding. A further point to be considered in selecting the site is the proximity of the stack to the field in which the crop to be used is growing. A rectangular-shaped stack is to be preferred to a square stack, one of the main advantages being the reduction in the surface of silage exposed when the end of the stack is opened for feeding.

Framework.

The framework consists of bush timber from 4 inches to 6 inches in diameter at the butt end, erected in the manner shown in Plate 98. The poles are sunk in the ground to a depth of approximately 20 inches, and should be at least 15 feet above ground. The top plates and the brace at each permanent end of the stack should be fastened to the uprights with a wire twitch. Where a stack of large dimensions is being built, or where a light framework is used, it is advisable to provide one or more cross braces for the framework. When only one cross brace is used, it should be fastened to the central upright on either side, and provision made for the central uprights to be at least 3 feet higher than the others. It is then possible to have the central brace much higher than the top of the framework, and thus offering less obstruction when stacking the material as the stack is nearing completion. Any other cross braces used should be handled in the same manner as the central brace. In addition to the uprights required for the framework, a pair should be erected at each end of the stack to bear the cross piece which is used to support the ends of the fodder until they are trimmed off level with the permanent end of the stack. The uprights along the side should be spaced 3 feet apart when long-stalked crops are being stacked. The distance is reduced to 2 feet 6 inches or, if necessary, to 2 feet for shorter-stalked crops like white panicum or Sudan grass. Where possible, the framework should be erected close to a tree, which can be used to support the whip for lifting the material when the height of the stack calls for its use.

Stacking.

Before commencing the stack, a layer of green grass, at least 6 inches in depth, should be spread evenly over the ground to prevent the silage from coming in contact with the earth.

When stacking maize or sorghum, the farmer should begin by laying the material in such a way that the heads of the plants extend 3 feet to 3 feet 6 inches beyond the permanent end of the stack, the distance being reduced to suit shorter-stalked crops. He should continue to lay the material evenly, with the heads facing the one way, until the butts of the plants extend a similar distance beyond the opposite permanent end. The material should not be laid end to end, but should be laid in such a manner that it overlaps for about one-third of its length. After placing a layer along the entire length of the stack, the next layer should be commenced by laying the material in the reverse manner—i.e., the butts should be facing the direction in which the heads are facing in the previous layer. The work should be continued in this manner to the

Plate 98.
Silage Stack in Course of Erection.

opposite end of the stack. By reversing the layers in the manner described it is possible to maintain an even surface, particularly when heavy-stalked crops are being stacked. When the material has been stacked to a height of 2 feet 6 inches, the projecting ends of the material being stacked should be trimmed off flush with the uprights which are to form the true end of the stack. A sharp cane knife will be found very suitable for trimming the ends. Before stacking is resumed, the cross piece which is used to support the projecting ends of the material should be raised level with the top of the stacked material and fastened to the additional uprights which have been provided for that purpose. Each time a similar quantity of material has been added to the stack the projecting ends are trimmed as previously described, and the cross piece again raised level with the top of the stack. The trimmings should be laid along the centre of the stack. During the whole time stacking is in progress, the material should be well trampled along the sides.

When the material is carted by dray or lorry, it is not necessary to use a whip or hoist until the stack is nearing completion, as the material may be handed from the vehicle to the person on the stack. In this case it is very necessary that the material be received from both sides of the stack, for if received from one side only, the extra trampling will cause a much more rapid settling on that side. As a consequence, the material on the opposite side of the stack will not consolidate sufficiently to permit of the production of good silage.

After stacking has been finished at the end of each day, it is a good plan to add weight to the stack. An easy and effective way of doing so is by passing lengths of fencing wire over the stack and suspending a long pole from these on either side of the stack. These poles should be suspended well clear of the ground, as a considerable amount of settling takes place during the night. Very little additional time is required in applying the weight each evening and releasing it the following morning.

When the whole of the material has been placed in the stack, a layer of green grass at least 6 inches in depth should be spread over the top of the stack. Earth, stones, or other weighting material should then be placed on this, forming a camber along the length of the stack. When earth is used, it is advisable to lay light logs along each side and end on the top of the stack to form a bed to keep the earth in position. To provide the required pressure, a layer of earth at least 1 foot in depth is necessary. After placing the weighting material in position, a covering of dry grass should be placed on top of this, and as it is very necessary that water should not gain access to the silage, the earth and grass should be placed in such a way that rain water is turned over either side of the stack. This means that, when completed, the stack will be appreciably higher along the centre than at the sides.

Opening the Stack.

The silage should be removed from one end of the stack only, using a hay knife or broad axe to cut a shelf from top to bottom. Only sufficient of the covering should be removed to permit of each day's requirements being taken out, and as small a surface as possible should be exposed to the air. A certain amount of wastage will inevitably occur on the ends and sides, but, providing the material has been carefully stacked at the right stage of growth, and the silage has not been kept for more than four or five months, the wastage should not be great.

II. SILO CONSTRUCTION.

L. WOOD, Field Officer, Agricultural Branch.

The tower, the circular pit, and the trench are the three types of silo used in Queensland, and each was therefore mentioned in the notes dealing with silage and silos. The construction of the trench type of silo is so simple that the description already given therein requires no amplification. The construction of the other two types, however, is more complicated and, in the case of the tower silo, calls for the use of reinforced concrete; the circular pit silo may have only a concrete collar, but it is preferable to have it completely lined with concrete. It therefore seems appropriate to deal firstly with the mixing of concrete, and then to discuss the construction of the tower and the circular pit types of silo in such detail as is requisite.

SELECTION OF CONCRETE-MAKING MATERIALS.

Due care should be exercised in the selection and measuring of the sand, metal or river gravel, and water to be used in making the concrete mixture. The quality and proportions of the materials used have a definite influence on the strength of the concrete made from them. The sand should be clean and sharp and free from all vegetable matter, such as leaves and grass roots, as well as from any other foreign matter. It may be tested by rubbing a small quantity between the hands, and should doing so cause them to become dirty, the sand must be washed. It may be washed in a small trough 6 feet long and 1 foot 6 inches wide, a small cut being made at one end through which the foreign matter is carried off by a flow of water. The sand should be stirred round with a shovel, and the flow of water maintained until all foreign matter has been removed. Very fine sand is not as suitable as that which is classed as medium fine. If fine screenings from crushed rock are procurable they may be used instead of sand. The term metal is applied to the coarse aggregate which is actually crushed rock, and for general concrete work any hard rock may be used; it should range in size from about 1½ inches in diameter to small screenings about half that size. It is sometimes imagined that very large stones tend to strengthen concrete but, while they may be used in thick walls and foundations with a view to saving cement, they should not be used where the thickness of the concrete is not sufficient to give at least 1½ inches of material between the "plums," as they are called, and the outer face of the concrete. Where river gravel is used instead of metal, the sand naturally occurring with it will have to be screened from it because river-run gravel usually contains a large percentage of sand. The correct quantity of sand required for the concrete mixture will then have to be added to the river gravel which has been freed from the unknown proportion of sand which it contained when it was dug from its bed. It is important that only clean water, free from oil and dirt, be used.

PROPORTIONS, MIXING, AND PLACING OF MATERIALS.

A measuring-box should be employed to ensure that the correct proportions of the materials for the concrete mixture are used. When the proportions in which they are to be mixed are 4-2-1—i.e., 4 parts of metal or river gravel, 2 parts of sand, and 1 part of cement—a bottomless box with sides measuring 2 feet 1 inch by 2 feet and 1 foot deep, inside measurements, should be constructed with a division in the middle.

This will hold exactly 4 cubic feet of metal when the whole of the box is filled level. Two cubic feet of sand is then measured out, by filling one-half of the box, and one paper bag of cement is added to the other two materials. This gives a conveniently sized batch to mix by hand. Cement is now supplied in paper bags which hold 1 cubic foot, twenty-four of which weigh 1 ton.

When mixing by hand the work is facilitated by constructing a proper mixing board, which should be about 10 feet by 10 feet. The dry material should be mixed thoroughly until it is all of a uniform colour. The water should be added by using a watering-can with a rose attached, the dry materials being gradually wetted as the mass is being turned. The water should not be allowed to run off the mixing board because, if it does so, it carries away a large proportion of the cement with it. The materials should be thoroughly mixed after the water has been added, and the concrete placed in position as soon as possible after mixing. It should be well rammed as it is being placed in the moulds, and the surface should be roughened before finishing the layer off in order to form a key, and so ensure a good bind for the next layer. The joint must be strengthened with cream of cement before adding fresh concrete to that which is set; this can be prepared by adding sufficient water to some neat cement to bring it to the consistency of thick cream. Green concrete will not stand a bump, and care and patience is necessary when removing the moulds. All working tools, such as buckets and shovels, and the mixing board should always be attended to when mixing is finished, and should be thoroughly washed before the concrete sets on them.

REINFORCEMENT OF CONCRETE.

It is sometimes necessary—and, indeed, in the case of a tower silo it is essential—to strengthen the concrete by embedding within it steel in the form of rods, wire-netting, or some other type of metal mesh. The steel is elastic and extremely strong in tension, while concrete is strong in compression, but comparatively weak in tension. The combination of the two materials with their opposite characteristics, therefore, gives an ideal product, known as reinforced concrete.

SIZE OF SILO.

One of the first points to be considered when preparing to build a tower or circular pit silo is the size that will meet the requirements of the farm on which it is to be erected. In determining the required size, consideration must be given to the number of head of stock it is intended to feed, and to the duration of the feeding period. As each cow is fed at the rate of approximately 30 lb. of silage daily, it is a simple matter to arrive at the required size on a dairy farm. The following table of capacities will be useful in determining the size to build, allowing 51 to 56 cubic feet of silage to the ton, the smaller figures being applicable to the larger silos. These calculations are based on the assumption that the silos are completely full of consolidated silage, which, of course, is rarely possible as some allowance must be made for subsidence. However, if the material is well trampled during the whole time filling operations are in progress, only a small allowance need be made for subsidence.

APPROXIMATE CAPACITY OF ROUND SILO IN TONS.

Inside Height.	Inside Diameter of Silo.						Cubic Feet of Silage to the Ton.
Feet.	10 Feet.	11 Feet.	12 Feet.	13 Feet.	14 Feet.	15 Feet.	
20	28	34	40	47	55	63	56
21	29	36	42	50	58	66	56
22	31	38	45	53	61	71	55
23	33	40	47	55	64	74	55
24	35	42	50	59	68	78	54
25	36	44	52	61	71	82	54
26	38	46	56	65	76	87	53
27	40	48	58	68	78	90	53
28	42	51	61	71	83	95	52
29	44	53	63	74	86	99	52
30	46	56	67	78	91	104	51

The following table shows the quantities of materials required in the construction of each foot of a concrete silo wall of 4-inch thickness when using a 4-2-1 mixture; it also gives the materials required for the foundations of a tower silo:—

Diameter in Feet.	Portion of Silo.	Metal or River Gravel.	Sand.	Cement.
		Cubic Feet.	Cubic Feet.	Cubic Feet.
10	Wall	9·36	4·68	2·34
	Floor..	23·12	11·56	5·78
	Foundations ..	49·20	24·60	12·30
11	Wall	10·28	5·14	2·57
	Floor..	27·40	13·70	6·85
	Foundations ..	54·12	27·06	13·53
12	Wall	11·00	5·50	2·75
	Floor..	32·00	16·00	8·00
	Foundations ..	58·80	29·40	14·70
13	Wall	11·92	5·96	2·98
	Floor..	38·20	19·10	9·55
	Foundations ..	63·52	31·76	15·88
14	Wall	12·88	6·44	3·22
	Floor..	44·52	22·26	11·13
	Foundations ..	68·20	34·10	17·05
15	Wall	13·80	6·90	3·45
	Floor..	51·08	25·54	12·77
	Foundations ..	72·64	36·32	18·16

TOWER SILO CONSTRUCTION.

Details for the construction of a tower silo are given in the following paragraphs, quantities of materials, moulds, and construction being discussed in considerable detail.

Quantities of Materials.

The following materials are required for the construction of a tower silo 14 feet in diameter and 28 feet in height, with walls and floor 4 inches thick, and designed to hold approximately 83 tons of silage:—

	£	s.	d.
Concrete—			
Metal or river gravel, 17⅕ cub. yds., at 12s. 6d. per yd.	10	15	0
Sand, 8⅗ cub. yds., at 10s. per yd.	4	6	0
Cement, 116 bags, at £4 14s. per ton	22	17	4
Reinforcement, comprising—			
Round bars, ⅜ in., 6 cwt. at 17s. per cwt.	5	2	0
Tie wire, 5 lb., at 6d. per lb.	0	2	6

		£	s.	d.
Door Frames (3)—				
5 in. x 4 in.—6/2 ft. 10 in. to cut 12 bevelled pieces, 3 in. x 2 in. x 4 in.				
2 in. x 2 in.—12/2ft. 6 in.		1	7	0
4 in. x 1 in.—14/2 ft. 6 in.				
6 lengths ⅜ in. x 1 ft. spikes with end hooked for holding frame in position		0	1	6
Roof Timber—				
Rough Hardwood—				
Bearers, 5 in. x 3 in.—2/12 ft. 6 in., 2/17 ft.	98 super. ft., at 43s. per 100	2	1	4
Collar ties, 4 in. x 2 in., 4/8 ft.				
Rough Pine—				
Rafters, 4 in. x 2 in.—14/9 ft.				
Braces, 3 in. x 1½ in.—2/18 ft.				
Battens, 3 in. x 1½ in.—8/17 ft.	184 super. ft., at 35s. per 100	3	4	0
Ridge Board, 7 in. x 1 in.—1/17 ft. ..				
Fascias, 7 in. x 1 in.—2/9 ft.; 2/17 ft. ..				
Bolts, Corrugated Iron, &c.—				
Anchor bolts and screws, 8/1 ft. 6 in. x ½ in., for securing plates to top of wall, at 2s. each		0	16	0
Bolts for collar ties, 6/4½ in. x ⅜ in. at 3d.		0	1	6
Hoop iron strips, 14/1 ft. 6 in. long, to strap rafters to bearers, at 2d. per lb.		0	4	5
18 sheets 9-ft. iron, at 5s. 5d. per sheet		4	17	6
3 lengths ridge capping, at 1s. 9d. each		0	5	3
3 lb. springhead screws, at 2s. lb.		0	6	0
Nails—				
3 in. x 9 gauge (5 lb.)				
4 in. x 8 gauge (3 lb.)	at 4d. lb.	0	3	4
2 in. x 11 gauge (2 lb.)				
Ladder—				
Rough pine, 3 in. x 2 in., 2/30 ft., at 35s. per 100 super. ft.		0	10	6
Rungs—				
Bolts, 4/1 ft. 6in. x ½ in., at 1s. 6d. each		0	6	0
21 lengths iron, 14 in. long, at 2d. per length		0	3	6
Paint		0	5	0
	Cost of materials	£57	15	8
Cost of labour—				
Excavation for foundation, &c., approximately 3 ft. below ground level, 26 cub. yds., at 4s. per yd.		5	4	0
Mixing and placing all concrete, &c., 1 man 10 days at £1 2s. 8d. and 3 men 10 days at 17s. 8d.		37	16	8
Constructing roof, doors, ladder, &c., 1 man 2 days at £1 2s. 8d. and 2 men 2 days at 17s. 8d.		5	16	0
Cartage, &c., on moulds, timber, &c.		3	0	0
	Cost of labour	51	16	8

The total cost is thus £109 12s. 4d., but this figure will naturally be subject to considerable fluctuation from year to year and from locality to locality.

Moulds.

In the construction of the tower silo it is necessary to use moulds or forms of some description when placing the concrete mixture in position in the gradually rising wall of the silo. These moulds are made in sections and usually consist of eight inside and eight outside sections about 3 feet high (Plate 99). If the moulds are set up level at the commencement of construction little difficulty is experienced in keeping the wall of the silo plumb and in a true circle. A wooden frame covered with flat galvanised iron is the type of mould recommended as the most suitable, because it is light and easily handled. The galvanised iron facing gives a smooth finish to the work, which is necessary on the inner surface of the silo to prevent settling of the silage being retarded.

With a view to assisting farmers in the construction of silos the Department of Agriculture and Stock has made a number of sets of moulds of this type, which are lent to farmers on application.

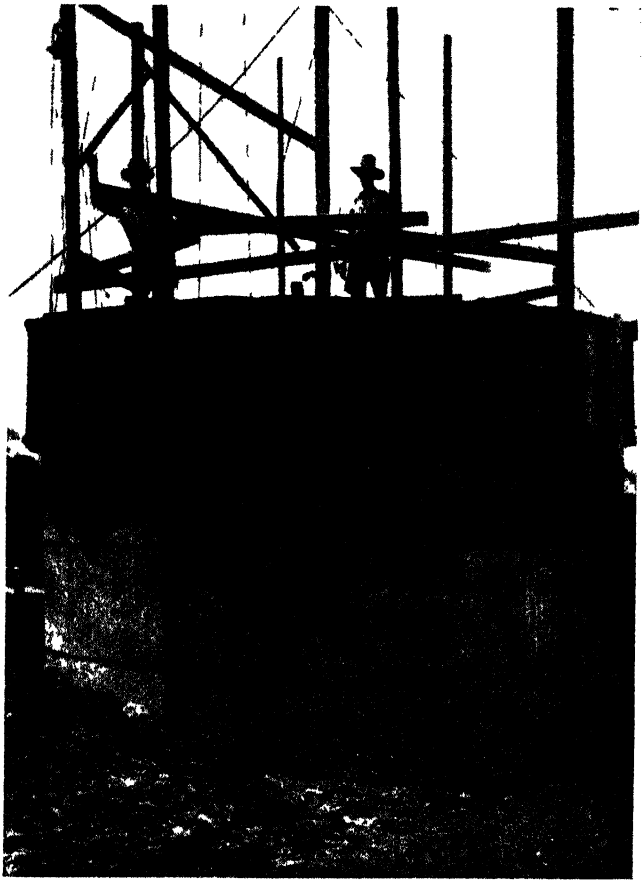


Plate 99.
TOWER SILO IN COURSE OF CONSTRUCTION.—Showing Moulds in Position for Filling.

Marking Out the Site.

All that is required to mark out the site for the silo is a piece of string and two pegs. One peg is driven into the ground at the spot which is to be the centre of the silo. A piece of string is then fastened to this by a loop, the other peg being attached to the string at a distance from the centre peg equal to half the outside diameter of the foundations. A circle is then described, which will be the outside circumference of the silo.

Foundations.

The weight of the materials required to build a tower silo of the dimensions given amounts to approximately 30 tons, and it is therefore evident that a solid foundation is necessary; otherwise settling will occur which will have the effect of cracking the wall and causing considerable damage to the structure. The foundations should be 2 feet wide and

1 foot deep, and every care should be taken to ensure that the wall is constructed in the middle of the foundations so that the weight of the wall will be evenly distributed. The soil should be excavated to a depth of approximately 3 feet, and deeper still if a compact soil is not reached at this depth. By excavating, the height above ground is reduced and a solid foundation below the frost line is assured. If in doubt about the soil formation, it is advisable to obtain advice from some person experienced in concrete construction so that sound foundations will be laid. Steel reinforcing rods ⅜ inch in diameter should be placed in the foundations spaced about 9 inches apart and connected by No. 8 fencing wire.

Floor and Reinforcement.

The floor, which is usually 4 inches thick, should also be reinforced with ⅜-inch diameter rods, placed at 1 foot 6 inch centres, hooked and tied to the rods of the foundations. In placing the concrete, the foundations and floor are laid in the one operation, but before pouring the concrete, provision should be made to place the vertical reinforcing rods in position. These rods, which should be placed at intervals of 2 feet, are hooked and tied to the reinforcement in the foundations. Horizontal reinforcement should be wired to the vertical rods already set when the concrete is placed for the foundations. Where it is necessary to join horizontal reinforcement, the rods should be lapped at least 1 foot 3 inches and tied together with tie wire. For vertical reinforcement a lap of 1 foot 6 inches is necessary. The first horizontal ring of rods should be placed about 3 inches above the floor, and from there upwards to a height of 8 feet 3 inches the rods should be spaced at foot intervals; for the next 7 feet 6 inches they should be spaced at 1 foot 6 inches intervals, and from that height to the top of the silo every 2 feet. The closer spacing towards the bottom of the silo is necessary to withstand the pressure exerted by the settling of the silage. Provision should be made in placing the rods in position to allow for doors, which are spaced 5 feet apart, the first being at 2½ feet from the ground and the other two at 5 feet intervals, one above the other. All reinforcing should be well covered with concrete, as any rusting due to exposure of the steel will weaken the structure.

Building the Wall.

The moulds should be well greased before use in order to prevent adhesion of the concrete and to facilitate their removal. Crude oil or soft soap is generally used for this purpose and is applied with a swab. Each time the moulds are removed they should be scraped to remove any adhering concrete and then regreased before being placed in the next position. Each inside mould is held in position by the 4-inch by 3-inch or other suitable upright which passes through a mortice provided in the mould for that purpose. The uprights should be plumbed and well braced to ensure that the wall is true. As the outside moulds have no uprights to support them it is necessary that they be bolted to the inner circle using long bolts for this purpose. These bolts should be greased before use to enable them to be withdrawn easily. The small holes which are left after their removal are then plugged up with fine mortar.

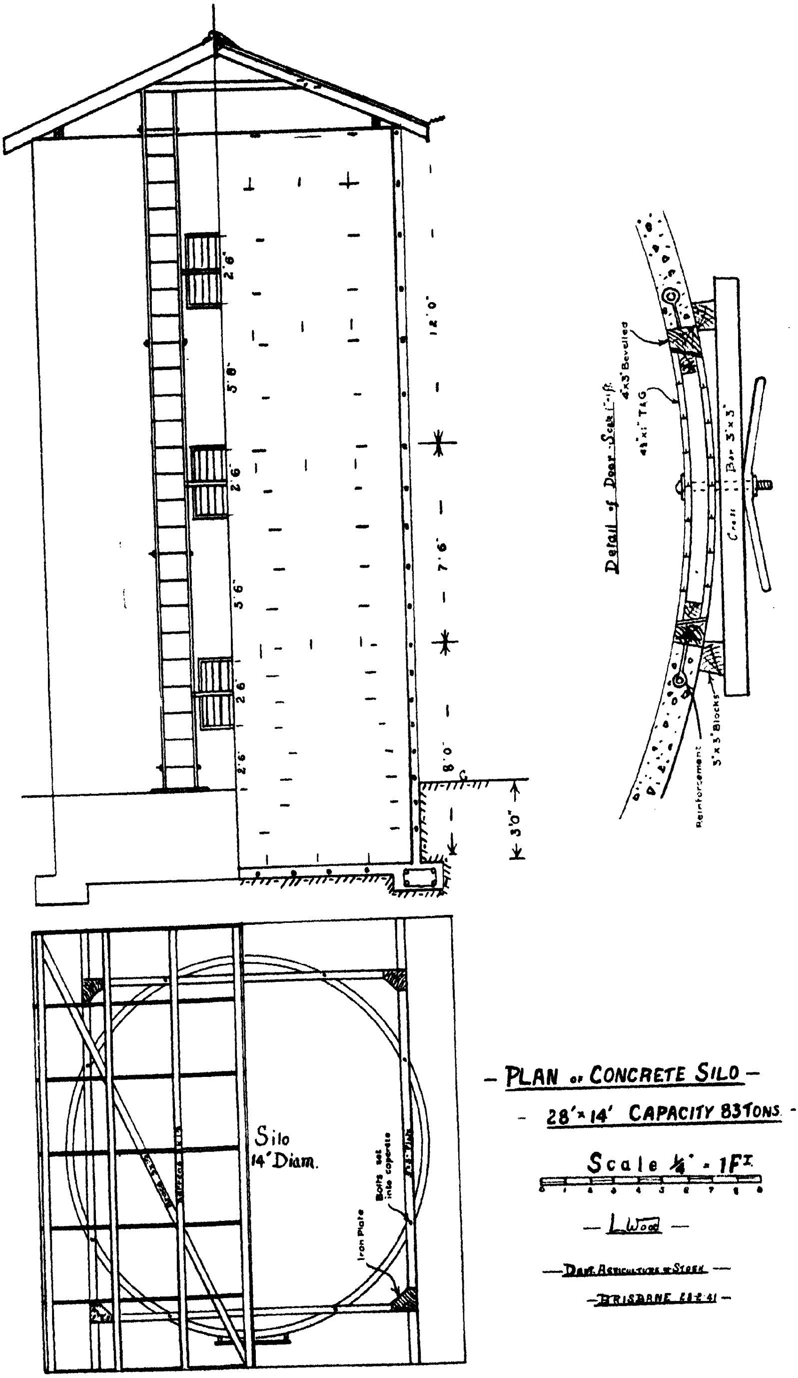


Plate 100.

Plan of Tower Silo.

Another method of supporting the outside moulds and scaffolding is to place eight slightly tapered blocks, 4½ inches by 3½ inches and 4 inches long, in between each section of the moulds about 2 inches below the top, before the moulds are filled with concrete. After the moulds have been removed, the blocks are taken out by tapping the smaller end lightly. Their removal in each case leaves a hole in the wall through which a bearer or "pudlock" about 8 feet 6 inches long is inserted, allowing one end to project about 1 foot 3 inches on the outside of the wall. The other end is supported on a cleat bolted around a 4-inch by 4-inch upright placed in the centre of the silo. The blocks are placed in position for each rise and the cleat is moved up the 4-inch by 4-inch upright to carry the ends of the bearers which support the moulds and scaffolding planks. The holes in the wall are usually filled in while the scaffolding is at a suitable height. This is done by inserting small concrete blocks, cast to the required size, which are then plastered over.

Before placing a fresh batch of concrete, the previous layer should be well cleared of any loose material and moistened, and to it there should be applied a thin covering of cream of cement. Only small quantities of the latter should be mixed at a time and care should be taken to ensure that it has been spread over the whole surface before adding a fresh layer of concrete.

The concrete should be well rammed into the moulds in order to secure a smooth dense wall which will be airtight and impervious to water. A spading tool made from a piece of ½-inch iron about 6 feet long with a fish tail at the lower end, or a piece of thin board bevelled at one end and run off to form a handle at the other end may be used. The use of this tool forces the coarse material away from the mould, allowing the finer mortar to come to the face of the wall and produce a smooth surface. Each day the moulds are lifted, allowing for about 2 inches of a lap on the previous ring of concrete.

Door Frames.

The frames for the doors, which should be 2 feet 6 inches square, should be constructed with 5-inch by 4-inch hardwood sawn lengthways to make bevelled pieces 3 inches by 2 inches by 4 inches. The frames are made with the bevelled edges towards the inside of the silo (Plate 100) on the same principle as that of a refrigerator door so that when the doors are placed in position they may be screwed up tightly, to exclude the air, with a hand screw and bolt. The doors are constructed on bevelled frames to suit the opening, lined on both sides with 4-inch by 1-inch tongue and groove, the space between being filled with sawdust or some other insulating material; if required, the doors can be packed with felt or bagging to ensure a tight fit.

Difficulty is often experienced in keeping the silage in good condition around these doors, but if the instructions are carried out as detailed, little trouble will be encountered. Before setting the frames in position a few pieces of ⅜-inch iron about 1 foot in length should be driven into the frames at the sides, top and bottom, and connected to the reinforcing rods.

Roof.

The bearers to which the roof is fastened on the silo should be of heavy timber 5 inches by 3 inches and fastened to the top of the wall by bolts which have been set in the concrete. Anchor plates also should be bolted at each corner of these bearers; the two side bearers project 1 foot past the line of the side to allow for an overhang on the roof. Rafters 4 inches by 2 inches, spaced at 2 feet 9 inch intervals, should be securely nailed and strapped down to the bearers by 1½-inch hoop-iron straps. Four 4-inch by 2-inch collar ties are secured to every second pair of rafters about half way up. Roof braces 3-inch by 1½-inch should be nailed diagonally across on the underside of the rafters, and 3-inch by 1½-inch battens should be spaced every 3 feet. To give a finished appearance and make the silo weather-proof 7-inch by 1-inch fascias and barge boards should be securely nailed to the ends of the rafters before placing the iron in position. For securing the corrugated iron, springhead screws are preferable to nails as they withstand the elements better.

Ladder.

It is necessary that a long ladder be constructed and fixed to the silo alongside the doors. This can be made with 3-inch by 2-inch sides using lengths of ½-inch iron about 14 inches long for rungs. Four ½-inch bolts 1 foot 6 inches long should be placed about 10 feet apart to prevent the sides spreading. The inside width of the ladder should be 12 inches, thus allowing the rungs to be sunk 1 inch. Rungs should be spaced every 15 inches. The ladder is secured in position by placing it on to a sill piece and cleating the bottom, and bolting it to the roof timbers by a "bracket" or piece of timber on the top.

Scaffolding.

In the construction of the silo it is necessary that some kind of scaffolding be used and the timber required for the construction of the roof is generally made use of for this purpose. There are several methods of erecting this scaffolding, a very simple one being to place four uprights about 7 feet apart on the inside of the silo to which cross rails are secured at the height at which it is desired to erect the scaffolding. The rails are allowed to project past the uprights to about 9 inches from the wall and these projections carry the scaffolding planks, or if, as previously described, pudlock bearers are used, the planks may be placed both on the inside and outside of the silo. If a piece of heavy timber is bolted across the uprights about 8 feet above the scaffolding and allowed to project over the outside wall about 3 feet, the pulley blocks can be attached to this projection, thereby greatly assisting in the hoisting of materials.

CIRCULAR PIT SILO CONSTRUCTION.

As stated earlier, a circular pit silo may be either wholly concrete lined or the concrete lining may be confined to a collar 5 feet 6 inches in depth, the former type of silo being regarded as the better of the two.

The site of the circular pit silo is marked out in the same manner as adopted in the case of the tower silo, and a precisely similar type of mould is used for both. The details of the mixing and pouring of the concrete have already been fully dealt with when considering tower silo construction and further reference to them is unnecessary.

Sinking the Pit.

The sinking of the pit calls for the use of a considerable amount of labour, but much of the cost involved therein can be saved if the farmer does the work himself. To facilitate the digging of the pit, and the removal of the silage, as required, when the pit is completed and filled, a hoist (Plate 101) is so constructed as to allow it to swing over the pit. When sinking the pit, the earth or spoil is hoisted out of it in a large drum with a hinged bottom and a lever

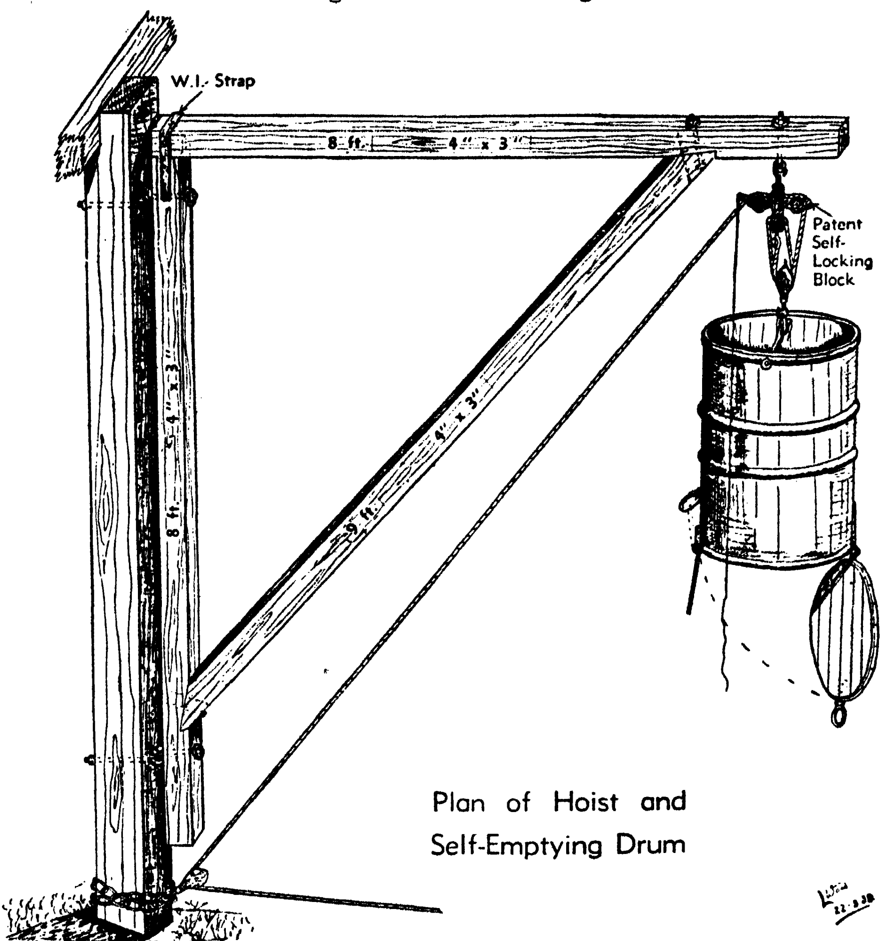


Plate 101.
HOIST.

catch attachment. The drum, full of spoil, is pulled to the surface by a horse, swung clear of the pit and, while the drum is suspended in the air, the catch is released, the hinged bottom of the drum drops, and the contents are deposited on a dray or where they may be readily removed afterwards by a horse and scoop. The hoisting gear should be provided with a patent self-locking pulley, which locks and keeps the load in any position without tying or holding the hoisting rope, the locking device coming into action the moment the rope is slackened. This self-locking block ensures the safety of the man working in the pit.

When trimming the wall of the pit, a piece of timber is placed across the diameter of the excavation, and held in position by means of pegs. Through this piece, a hole is bored to allow a length of piping to be placed vertically in the centre of the pit. A board equal in length to half the diameter of the desired excavation is then made to revolve around the pipe, which is kept plumb. This board acts as a guide or indicator, so that the wall may be trimmed perfectly true with a sharp mattock or old adze (Plate 102).

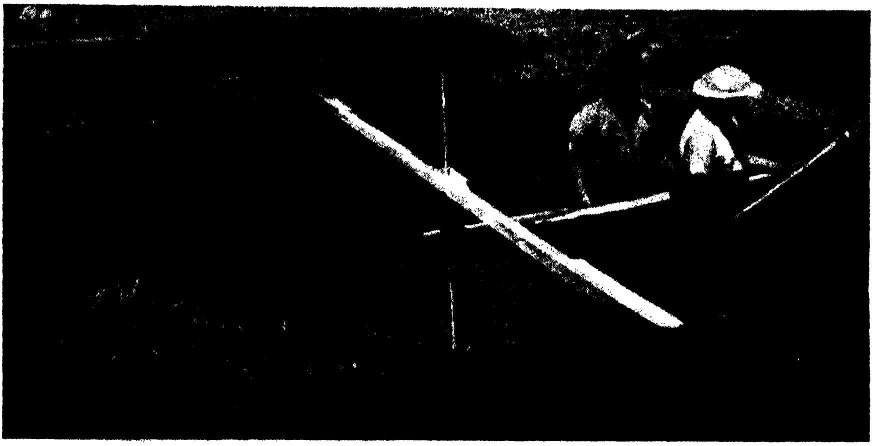


Plate 102.
TRIMMING THE PIT.

Building the Concrete Wall.

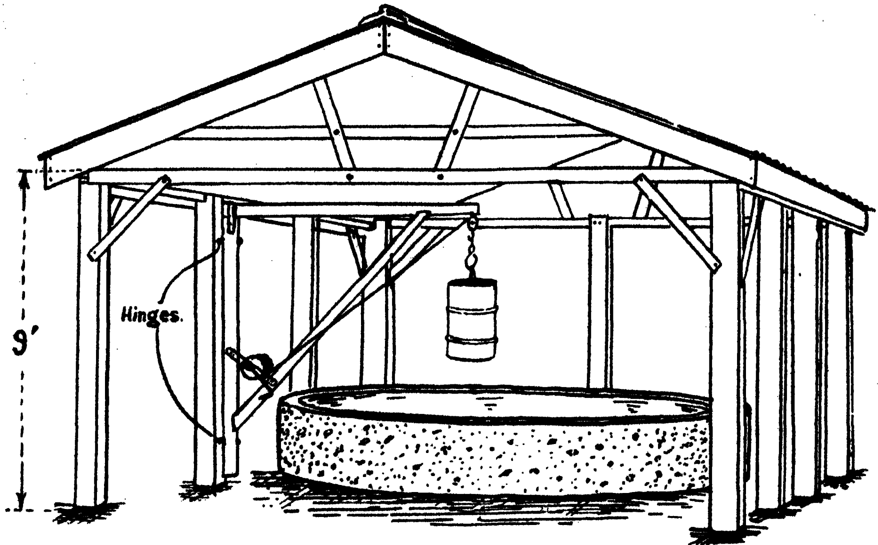
When the wall has been trimmed and the bottom of the pit levelled, the inside set of moulds is placed in position and filled with concrete. If carefully handled, the moulds may be removed the following day and set up for the next lift and filled again. It is not necessary to use the outside set of moulds until the top of the pit is reached. When both sets of moulds are used, spacing pieces must be placed between them to ensure that the correct thickness of wall is maintained. The concrete wall should be continued to a height of 2½ feet above ground level.

It is here necessary to refer to the fact that, in marking out a site for a circular pit silo with an inside measurement of 14 feet, allowance must be made for the 4-inch wall and the final excavation must therefore be 14 feet 8 inches in diameter. It is, however, thought preferable to initially excavate only 14 feet, thus leaving 4 inches all round to be removed in the trimming of the wall. This trimming is carried out every few feet as sinking progresses and enables the excavator to obtain a nice even surface.

Covering the Silo.

A shed covering is as essential in a circular pit silo as in the case of a tower. It may be a permanent fixture, providing ample head room to work under (Plate 103) or it may be a sliding roof (Plate 95). The former is preferable, as its cost of construction is little in excess of the latter, and it affords protection from the elements when emptying or filling the pit.

24′ x 18′ SHED OVER SILO.



Scale ¼″ - 1 FT.

0 1 2 3 4 5 6 7 8 9

Plate 103.

PLAN OF COVERING SHED.

Quantities of Materials.

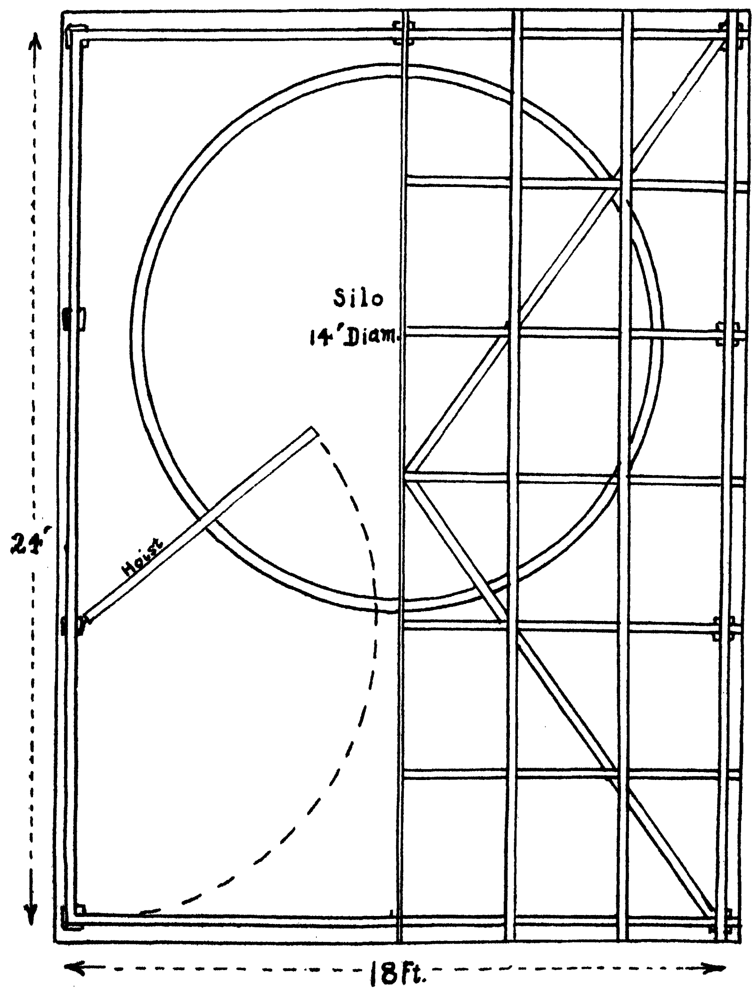
The following materials are required for a 28-foot pit silo with 25 feet 6 inches below ground level and 2 feet 6 inches above ground level, the silo to be concreted to the full depth with a 4-inch wall and floor. A 4-2-1 concrete mixture is allowed for. Provision is made for a shed 24 feet by 18 feet with a clearance of 9 feet, and for a hoist erected to assist in emptying operations, the hoist to be fixed to a convenient post by hook and eyebolt hinges.

	£	s.	d.
Concrete—			
Metal or river gravel, 15¼ cub. yds., at 12s. 6d. per yd.	9	10	7
Sand, 7 5/9 cub. yds., at 10s. per yd.	3	15	6
Cement, 102 bags, at £4 14s. per ton	19	19	6
Reinforcement (floor and portion of wall above ground level only), 32 yds. K wire	0	18	0
Shed and Hoist—			
Posts, 5 in. x 5 in., or round bush timber—9/11 ft., at 9d. per ft. ..	3	14	3
Rough Hardwood— Plates, 4 in. x 3 in.—2/24 ft., 2/18 ft.; Corner, 4 in. x 2 in.—4/6 ft. ..; Post bracers .. .. — at 43s. per 100 super. ft.	2	3	0
Rough Pine— Rafters, 4 in. x 2 in.—14/10 ft. ..; Collar ties for roof, 4 in. x 2 in.—3/12 ft. .. ..; Struts for roof, 4 in. x 2 in.—4/3 ft.; Braces for roof, 3 in. x 1½ in.—4/15 ft. .. ..; Battens for roof, 3 in. x 1½ in.—8/25 ft. .. ..; Fascias for roof, 7 in. x 1 in.—2/25 ft., 4/10 ft. .. .. ..; Ridge Board, 7 in. x 1 in.—1/25 ft. — at 35s. per 100 super. ft.	5	1	6
Rough Hardwood—Hoist, 4 in. x 3 in.—2/8 ft., 1/9 ft., at 43s. ..	0	10	9
Iron, 28/10 ft. sheets, at 5s. 8d. sheet	7	18	8
Ridge Capping—5/6 ft. lengths, at 1s. 9d. per length	0	8	9

Nails—			
3 in. x 9 gauge (5 lb.), at 4d.; 4 in. x 8 gauge (3 lb.), at 4d.; Springheads (5 lb.), at 1s. 2d.	0	8	6
Bolts for posts, 9/8½ in. x ½ in., at 6d.	0	4	6
Bolts for collar ties, 6/4½ in. x ⅝ in., at 3d.	0	1	6
Hinges for hoist—2/4½ in. x ⅝ in. eyebolts and 2/8½ in. x ⅝ in. hooks for same, at 4s. 6d. pair	0	4	6
Cost of materials	£54	19	6
Labour—			
Erecting shed and hoist, &c., 1 man 3 days at £1 2s. 8d. and 1 man 3 days at 17s. 8d.	6	1	0
Excavating pit 25 ft. 6 in., at £1 per ft.	25	10	0
Setting up moulds and filling same—2 men 10 days at 17s. 8d. 1 man 10 days at £1 2s. 8d.	29	0	0
Cost of labour	£60	11	0

The total cost of this type of silo is therefore £115 10s. 6d., but, as in the case of the tower silo, costs will fluctuate from year to year and from district to district.

GROUND PLAN.



Collar Type of Circular Pit Silo.

The discussion of the circular pit silo has so far been confined to the type which is wholly concrete lined, but much of the information supplied for that type is equally applicable to the circular pit silo in which the concrete lining is confined to a collar 5 feet 6 inches in depth. In the case of the collar type, however, the diameter of the excavation is 14 feet 8 inches only until a depth of 3 feet below ground level is reached, for at that depth the concrete collar ceases, and from there on the excavation should be only 14 feet in diameter. When the pit has been excavated to a depth of 3 feet, the concrete collar is constructed, the shed is built, and then the pit is excavated until the full depth is reached.

Circular pit silos of other dimensions may, of course, be constructed, but the dimensions given are those most likely to meet the requirements of the average farmer and are the dimensions for which departmental moulds are available on loan.

It has previously been stated that the approximate cost of the fully-lined circular pit silo is £115 10s. 6d., and this compares with an approximate figure of £75 for the collar type. The combined cost of the shed, the hoist, and the excavation are virtually identical, the difference in price being due to the lesser quantity of concrete used.

WE HAVE MUCH TO LEARN ABOUT THE SOIL.

Men have tilled the soil for thousands of years. Millions of farmers have spent practically all their lives at this work and many of them have observed closely the response of soil to different kinds of treatment. Thousands of agricultural scientists have studied the soil intensively and carried on countless experiments to find out just what makes the soil fertile and under what kind of treatment it will give the highest crop yields over a period of years. Under these conditions it would seem as though the secrets of the soil should have been discovered long before this and that more or less standard formulae for handling any particular soil to obtain best results should be available. It is true that many facts about the soil have been learnt, but it also seems true that the more we find out about it the more we realize how much more there is still to be learnt. It is amazing and, to the farmer, perhaps rather discouraging, how many beliefs about the soil which have for years been accepted as facts have been proved wrong in recent investigations. For example, take humus. For years we have been told that a fertile soil depends upon keeping an abundance of humus—decayed vegetable matter—in it, but now we are being told that the kind of humus present is very important and that the wrong kind may reduce rather than increase crop yields. At least, this is held to be true in certain soils and in some localities. Even the method and amount of tillage and cultivation seems to be open to a lot of argument. Some farmers hold that very thorough cultivation is the most profitable. Others maintain that just enough to control weed growth is all that should be given. These are only two of the many instances to show what a wide difference of opinion exists in the matter of soil fertility and soil management, but they certainly indicate that we have much yet to learn about soil in spite of the fact that the human race has always depended upon it for existence.—*From the "New Zealand Farmer Weekly."*

Poultry Farming in Queensland.

(*Continued from page* 231, *September*, 1941.)

FEEDING OF POULTRY.

THE success of poultry-farming depends more upon the feeding of the stock than upon any other single factor. By far the biggest charge against the industry is the cost of feed. This involves the expenditure of more than 50 per cent. of the gross income from the farm. Other factors being equal, the real test of the value of a poultry ration is the resultant profit. While feeding is not an exact science (*e.g.*, it cannot be stated that so much of certain ingredients will give certain results), carefully controlled experiments have indicated what are the essential constituents of rations, and, broadly speaking, how much of these constituents are essential in poultry rations. With this information, it is possible to make a combination of foods that will contain all the constituents essential for growth and production. It is stressed, however, that the ultimate success of feeding depends on the poultry-keeper himself, and his ability to judge the value of a food and its effect on the health and production of the flock.

Every penny saved in the cost of feeding is so much more profit, providing the health of the birds and the production is maintained. Poultry feeds vary in price, and the poultry-farmer is chiefly interested in the cheapest combination of foods which will maintain production. It is not a good practice to select at random a combination of the lowest-priced foods on the market, for such a combination may not maintain production. In order to select the cheapest suitable ration, whether it be a food already mixed or a combination of foods, a knowledge of the ingredients of foods and the requirements of poultry is necessary.

CLASSIFICATION OF FOOD INGREDIENTS.

The food groups or constituents are generally classified as follows:—Proteins, carbohydrates, fibre, fats (which include oils), minerals (ash), vitamins, and moisture. Each is essential in varying amounts; although moisture may be absent from a food, it must be given in the form of water. Some foods contain all these ingredients to a greater or lesser amount, but often one or more of the ingredients are absent.

Protein.

Proteins are complex substances formed by a combination of amino-acids. Amino-acids are made up of carbon, hydrogen, oxygen, and nitrogen, and, in a few cases, small amounts of other elements. There are about twenty amino-acids. Some of these can be manufactured by the fowl, but others cannot, and must, therefore, be included in the diet.

During the process of digestion, the proteins are broken down into amino-acids, and then absorbed into the system. These amino-acids are carried by the blood stream to wherever they are required to build protein in the body of the fowl, but any amino-acid will not suffice. Take a protein built up of the amino-acids which may be termed A, B, C, D, and E. Now suppose that the fowl can build up the amino-acids A and B, but not C, D, or E. Then, if the fowl is fed a protein containing amino-acids C and D only, the protein in the fowl cannot be built because, although it can manufacture the amino-acids A and B, the

amino-acid E is missing. If this protein is required by the fowl for growth, the fowl will not grow, and if required for producton of eggs, then the fowl cannot produce eggs. The ideal protein to feed would be one which contained all the amino-acids in their correct proportion to build all the various proteins in the fowl. Proteins derived from animals (animal proteins) come closest to this ideal—*e.g.*, meat meal, fish meal, and milk. Cereals, particularly maize, are low in some of the essential amino-acids, but what is lacking in one cereal may be made up by the use of another. Therefore, a combination of grains is most desirable.

Protein constitutes 20 per cent. of the body of the fowl and 12 per cent. of the egg. While growth and production can be retarded by a diet that is deficient in protein, feeding in excess of bodily and egg-producing requirements is wasteful, and may be harmful. Table I. showing the composition of foodstuffs indicates those which are high in protein. The excess amino-acids which are absorbed are not stored as such, but are converted in the liver into carbohydrates for energy production, or into fats which are stored.

Carbohydrates.

Carbohydrates are made up of carbon, hydrogen, and oxygen. The energy for movement, which comes from the burning of carbohydrates, includes the pumping of blood by the heart, breathing, movement of the intestines during digestion, and hunting for food, &c. Carbohydrates are also burnt to maintain body temperature.

Starches and sugars are the most common forms of carbohydrates in poultry foods. During digestion the starches and sugars are broken down to simple sugars which, in turn, are burnt to produce energy and heat in the body. The excess sugars are stored in the liver as glycogen, and the remaining surplus is then converted into fats and stored as such.

Fats.

Fats are also compounds of carbon, hydrogen, and oxygen, but the proportion of the three constituents in fats and carbohydrates is such that, given equal weights of fat and carbohydrate, there is about two and a-quarter times as much energy in fat as in carbohydrate. There is a large variety of fats (oil is liquid fat), most of which can be manufactured in the animal body. A few must be included in the diet; otherwise growth and production are retarded. On the other hand, too much fat in the ration will interfere with digestion so that the bird will be unable to make the best use of the ration supplied. The fat content of the ration should not exceed 5 per cent.

Minerals.

Minerals are often referred to as ash. Ash is that portion of plant or animal life which is left after burning. There are many mineral elements in ash, all of which are essential for normal growth and production. Generally speaking, the only minerals in which normal rations may be deficient are calcium and phosphorus and sodium and chlorine. As the fowl cannot store any appreciable amount of mineral matter, a constant supply must come from the feed.

Fibre.

Fibre comes largely from the bulky portion of a ration and is almost indigestible. If there is very much fibre in the ration it will

not only reduce the amount of food eaten, but will irritate the intestines and impair digestion. A ration too low in fibre also interferes with the health of the fowl.

Vitamins.

Vitamins are complicated chemical substances essential in minute quantities for normal life. A ration otherwise perfect, but lacking certain of these vitamins, will lead to disastrous results. Vitamins are known by the letters of the alphabet—A, B, C, &c. *Vitamin A* is probably the most important vitamin in poultry foods. It is concerned with the health of the respiratory and digestive systems, the eyes, and the reproductive organs. A fowl fed on a ration low in vitamin A is more susceptible to a number of diseases. A common symptom is nutritional roup, but long before this develops there is an increased susceptibility to disease and parasitic infestation, and a reduction in the efficiency of digestion and reproduction. A ration law in vitamin A will reduce the hatchability of eggs.

All green growing plants, particularly fresh green lucerne, are rich in vitamin A. Fresh green lucerne hay has about five times as much vitamin A as yellow corn—another good source of this vitamin. Lucerne hay—chaff or meal—loses its vitamin A content on being stored. Bran and whole wheat contain very small amounts of this vitamin. Some fish liver oils are an excellent source of vitamin A. The amount of green colouring in fresh cured fodder crops is an indication of the vitamin A content.

Fresh green feed is by far the most economical source of vitamin A; failing that, a ration containing 30 per cent. of yellow maize and 5 per cent. of choice fine-cut lucerne chaff or lucerne meal. If no yellow maize is available, then up to 10 per cent. of lucerne should be fed. Cod or other approved fish liver oil is at times unprocurable, but when available 1 per cent. of a good grade may be added to the ration to supply the vitamin A. This, however, is generally costly compared with fresh green feed or lucerne chaff. Further, the lucerne or green feed also provides other valuable food factors.

Vitamin B.—Most poultry rations contain an adequate amount of this vitamin.

Vitamin C is of little importance in poultry-feeding.

Vitamin D is associated with the absorption and utilization of calcium and phosphorus in the animal body and is therefore of greatest importance during the growth of the skeleton. Excess of this vitamin can cause trouble, but in practice this rarely occurs. Direct sunlight by its action develops vitamin D in the living animal. Ten minutes of sunlight each day would be quite sufficient to prevent any possibility of a vitamin D deficiency.

Where poultry (chickens or adult birds) cannot get sufficient sunlight, it is necessary to provide vitamin D in some other form. The oils rich in vitamin A are also rich in vitamin D and may be included in the ration if the birds do not have access to sunlight.

Vitamin E is associated with reproduction. Lack of this vitamin is said to cause infertility. Most poultry rations contain an adequate supply.

Vitamin K is usually supplied in adequate amounts when good grain is used in the ration.

OTHER ATTRIBUTES OF A FOOD WHICH MUST BE CONSIDERED.

Palatability.

No matter how well balanced a ration, it must also be attractive to the birds if sufficient is to be consumed for normal life functions. For example, barley as the grain portion of a ration contains almost the right quantities of protein and carbohydrate essential for egg production, but in practice it is found that fowls do not relish the grain and have to become accustomed to it. It may be as well to mention here that any alteration in the ration to laying stock should be made gradually, as sudden changes often cause a reduction in consumption with a consequent fall in egg yield. If this change is made in the autumn when young pullets are just coming into production, it may result in a false moult.

Digestibility.

The chemical composition of a food will give only a rough indication of its value, since no more than a percentage of the crude protein, carbohydrates, and fats and minerals is digested. In the graph prepared for comparing food values (Plate 105), allowance is made for this factor.

METHODS OF FEEDING.

Several methods of feeding are commonly practised, and in many instances with an equal degree of success. Each method has its own advantage and appeal to the individual feeder.

The methods are known as (1) wet mash and grain, (2) dry mash and grain, (3) all-mash, and (4) free choice.

Wet Mash and Grain.

The mash is a mixture of different ingredients, moistened to the extent that when a handful is squeezed it will remain in mass form, and when dropped a few inches will break into small particles. It would be more correct if this class of mash were termed "moist" instead of "wet."

With this type of feeding the mash must be prepared daily for distribution to the birds, care being taken to provide sufficient without allowing any to remain unconsumed half an hour after feeding. The mash should be placed in shallow, narrow tins or troughs, and as the food should be consumed within about half an hour, there should be no lack of feeding space, as the more timid birds will not procure all they require for maximum production.

It is usual to feed wet mash first thing in the morning and grain late in the afternoon. Many breeders reverse this order with successful results, and find that it fits in better with the daily routine.

Dry Mash and Grain.

A mash similar to that used for a wet mash is prepared dry and placed in hoppers. Birds are at liberty to consume the food at will, and although certain feeding space has been found necessary for best results, the more timid fowl has a better chance of securing its requirements from a limited space than is the case in wet-mash feeding. The advantage of this system of feeding is that instead of mixing and feeding mash daily, a quantity can be prepared and distributed once a week,

thus reducing the labour of feeding. A serious drawback, however, is that the constant supply of feed encourages rats to harbour in the poultry pens. With this system of feeding, grain is usually fed about 4 p.m.

All-Mash.

As the name suggests, nothing but mash is fed. A suitable mixture is made and placed in hoppers, to which the birds have access at all times throughout the day. With the all-mash system, quantities of food can be placed out once a week, thereby saving the daily attention of feeding. The birds are also compelled to consume a ration suitably balanced, and practical experience has shown that there is a possibility of preventing breeds of the heavy variety putting on excessive internal fat. Fowls do not take kindly to radical changes in grain-feeding, but with the all-mash system the meal of various grains may be substituted without any appreciable easing in production. Naturally, the conversion of grain into meals slightly increases the cost of feeding.

Free Choice.

Under this system of feeding, various kinds of foods are placed in hoppers or receptacles, and the birds allowed to select their own requirements. The range of foodstuffs must be sufficiently wide to supply all the food constituents essential to health and production. It has been noted that birds placed on this system of feeding, after being fed by other methods, have gorged on certain foods, but this gorging is only temporary. The birds soon adjust their feeding habits and consume only as much of the various foods as is necessary for health and production.

Feeding Systems Tested.

Experiments conducted in the United States of America have indicated that the free choice system of feeding is very satisfactory, although there was little difference between it and the mash and grain system; and that the all-mash system of feeding was the most costly. Therefore, the all-mash system is not advocated for the feeding of laying stock, although with chickens under the age of eight weeks where consumption is not great, it has given the most satisfactory results and proved economic.

FOOD REQUIREMENTS.

The first call made on the food digested is for maintenance of vital functions, such as the beating of the heart, breathing, repair of tissues, &c. Only after these requirements are met is digested food used for production. If fowls are not "full-fed" production suffers. "Full-fed" means as much as the birds will eat of a balanced ration. A hen in lay will consume approximately 4 oz. of food daily.

Proteins.

Extensive experiments have shown that the best rations for egg production contain about 15 per cent. of crude protein. A ration composed entirely of cereals and their pro-products is not only low in protein, but low in the quality of the protein. Some rich source of protein should be included, and part, if not all, should be of animal origin.

Fibre.

The maximum fibre that poultry rations should contain is 9 to 10 per cent. A ration of cereals and their by-products balanced with protein-rich foods will rarely exceed 6 per cent. fibre.

Good lucerne chaff contains about 30 per cent. of fibre. Hence 10 per cent. of such lucerne in the ration will meet the fibre position. More may be used, but only when the ration contains no yellow maize or vitamin-rich oils. In such cases only the choicest lucerne is good enough. Choice lucerne fed either as chaff in the ration or as green feed separately, will ensure adequate vitamin A.

Minerals.

It is necessary to add salt at the rate of ½ lb. to each 100 lb. of mash to supply the requirements of the fowl. Large amounts of calcium are also needed for the production of the egg shell. This requirement varies with production, hence it is best to supply the calcium needs in the form of limestone or shell grit, to which the birds should have access at all times. This should be placed in a separate receptacle.

To meet the normal calcium and phosphorus requirements of grown birds, 1½ lb. of sterilised bone meal should be added to each 100 lb. of mash when the animal protein-rich food does not include bone.

TABLE I.—SOME POULTRY FOODS.

Food.	Average Protein per cent.	Fibre per cent.	Maximum Percentage of Total Ration to Feed.	
			All-Mash.	Grain and Mash.
Group I.—Cereals.				
Maize and maize meal	9·5	3·0	60	60
Wheat and wheat meal	12·5	4·0	60	60
Barley and barley meal	10·6	5·0	30	30
Oats	10·0	11·0	30	30
Rolled or hulled oats	16·0	2·0	50	50
Wheat bran	14·7	11·0	30	15
Pollard	14·5	7·4	50	35
Sorghum	10·0	4·0	60	60
Whole rice	7·3	10·0	30	30
Millet	11·6	8·0	40	40
Group II.—Animal Proteins.				
Meat and bone meal	37 to 65	..	10	7
Buttermilk, dried	35	..	10	5
Buttermilk protein	68	..	10	5
Skim milk, dried	37	..	10	5
Skim milk, fresh	3·8	..	*ad lib.*	*ad lib.*
Group III.—Vegetable Proteins.				
Linseed meal	28	12	2	2
Cottonseed meal	40	10	5	2·5
Cottonseed meal, standard	30	25	5	2·5
Soybean meal	40	6	6	2·5
Peanut meal	48	6	5	5
Bean and pea meal	25	7	5	2·5
Coconut meal	18·5	12	5	5
Group IV.—Legumes.				
Lucerne chaff or meal	17	30	10	5
Lucerne leaf meal	22	15	15	7·5
Group V.—Supplements.				
Salt	..	..	0·5	0·5
Sterilized bone meal	13 to 20	..	1·5	1·5

FORMULATING RATIONS.

To prepare an all-mash ration, select at least three of the foods from Group I. in Table I. (no more than two to be of wheat origin if only three are selected). This group comprises from 70 to 90 per cent. of the ration.

Select at least one food from Group II., this to make up from 5 to 10 per cent. of the ration unless skim milk is available. If skim milk is fed at the rate of 4 gallons per 100 birds daily, there will be no need to include any feeds from Group II. Also, if the milk is fed at this rate, the protein content of the ration can be reduced by 3 lb. per 100 lb.

If the feeds of Group II. are much more costly than those in Group III., include one food from Group III.

If no green feed is fed, include 5 lb. to 10 lb. per 100 lb. of either of the feeds in Group IV., depending on whether yellow maize is being fed. Whatever the ration, include ½ lb. of salt. The full ration should contain approximately 15 lb. of protein and 8 lb. of fibre per 100 lb.

Where mash and grain are fed, the ration may be made up as with the all-mash ration, but allowance must be made for the fact that half of the ration will be fed separately as grain. In this case, the mash will have to be higher in protein in order to balance the low protein content of the grain portion of the ration, but the total of the two should supply the same amount of protein per 100 lb. of food fed.

In feeding laying hens, the effect of the foods upon the colour of the yolk of eggs should also receive consideration. Commercially, yolk colour does not appear to have caused any concern, but the consuming public do not favour pale-yolked eggs. To overcome this, green feed and yellow maize should form a part of a laying ration. In the absence of green feed, lucerne chaff or meal should be used.

Example.—To make a mash to be fed in conjunction with grain as an evening feed to laying hens requiring 14 to 15 per cent. of crude protein in the total ration:—

Ingredients.	Quantity	Protein.	Fibre.
	Lb.	Lb.	Lb.
As Grain—			
Sorghum	25	2·50	1·00
Maize	25	2·37	0·75
As Mash—			
Maize meal	15·0	1·42	0·45
Sorghum meal	12·5	1·25	0·30
Bran	10	1·47	1·10
Meat meal (63% protein)	5	3·15	..
Cottonseed meal	2·5	1·00	0·37
Lucerne chaff	5	0·85	1·50
Total	100	14·01	5·37

This ration is slightly deficient in protein. As the maximum amount of cottonseed meal has been used and the ration is still deficient in protein, peanut meal (a protein-rich food which can be used to a greater degree than cottonseed meal) will serve the purpose, displacing

cottonseed meal and 2½ per cent. of maize meal. The corrected ration will then be as follows:—

Ingredients.	Quantity	Protein.	Fibre.
As Grain—	Lb.	Lb.	Lb.
Sorghum	25	2·50	1·00
Maize	25	2·37	0·75
As Mash—			
Maize meal	12·5	1·18	0·37
Sorghum meal	12·5	1·25	0·50
Bran	10	1·47	1·10
Meat meal (63% protein)	5	3·15	..
Peanut meal	5	2·40	0·30
Lucerne chaff	5	0·85	1·50
Total	100	15·19	5·47

The protein level of this ration is almost as recommended, and the fibre is under the maximum.

COST OF FEEDS.

If all feeds were on the market at the same price, it would be more economic to buy some feeds than others. In other words, foods have different values when fed to poultry. For instance, bran has 15 per cent. of protein and maize has only 9·5 per cent., so on protein content bran is worth more; but maize has a total of 80 per cent. of digestible material and bran has only 50 per cent. The accompanying graph (Plate 105) gives a rough method of comparing the values of foods, allowing for the greater value of protein, as well as the total amount of digestible nutrients present.

Other factors which cannot be represented on the graph, but which have to be considered in computing the values of foods, are the attractiveness of a food, its vitamin content, the value of a food in improving the consistency of a mash, &c. These advantages or disadvantages must be carefully considered before arriving at the true value of a food.

TABLE OF WEIGHTS AND MEASURES.

In order to prepare mashes which will give maximum results it is necessary for the various ingredients to be weighed. As scales are not available on all farms the average weight of the various kinds of foodstuffs most commonly used is given for two convenient measures, the kerosene tin and the quart measure. These weights refer to the measures being filled but not pressed.

Kerosene Tin.

Bran	12 lb.	Maize (whole)	28 lb.
Pollard	18 lb.	Maize (cracked)	25 lb.
Lucerne meals	12 lb.	Wheat and Sorghum	30 lb.

Quart Measure.

	lb. oz.		lb. oz.
Barley meal	1 8	Linseed meal	1 0
Bone meal	1 12	Pollard	1 0
Bran	0 8	Salt (fine)	2 0
Maize (whole)	1 12	Wheat	1 12
Maize meal	1 8	Wheatmeal	1 8
Meatmeal	1 8		

Bushels to Short Ton.

Maize	35.7	Bran	100
Barley	40	Pollard	100
Sorghum	33.3	Oats	50
Wheat	33.3		

GRAPH SHOWING RELATIVE MONETARY VALUES OF FEEDS BASED ON DIGESTIVE NUTRIENTS AND PROTEIN CONTENT.

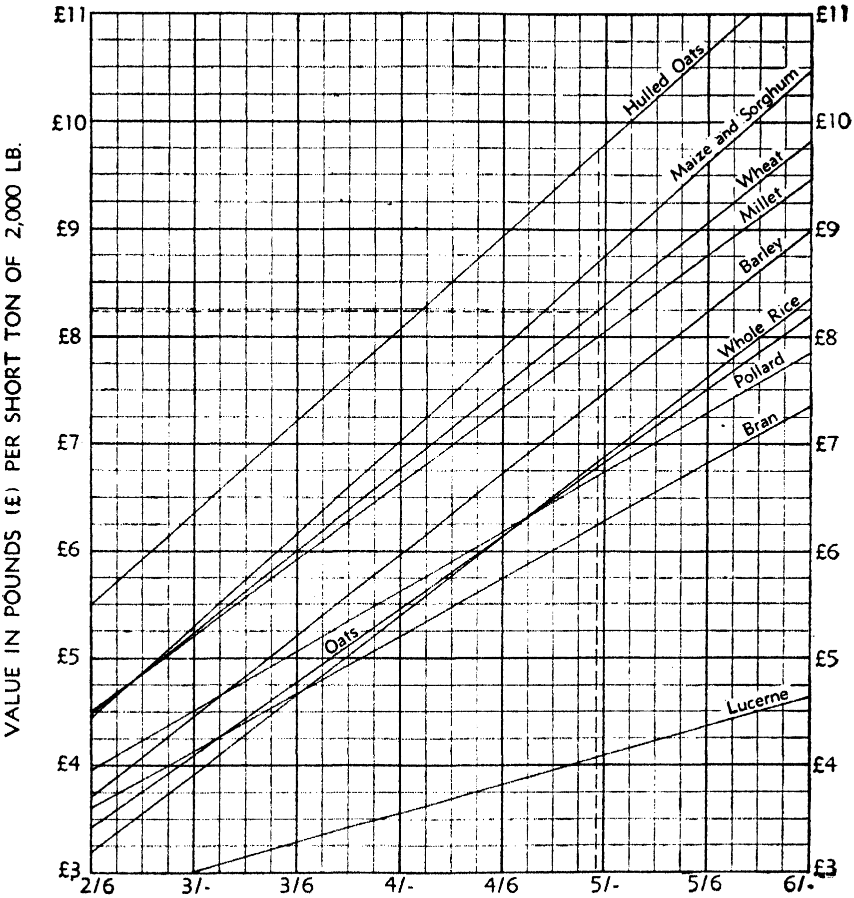


Plate 105.

The price of maize per bushel is used as a base. The feeds are compared vertically and the price for short ton is at the side. Thus, when the price of maize is 5s. per bushel wheat meal or wheat is worth £8 5s. per ton, as indicated by the dotted lines, and barley £7 10s. per ton. Again, if bran is at £6 per ton maize is worth 4s. 9d. bushel, or £8 6s. per short ton.

[TO BE CONTINUED.]

Noxious Weeds.

C. T. WHITE, Government Botanist.

AS the three plants, Star Burr (*Acanthospermum hispidum*), the Yellow-flowered Devil's Claw (*Martynia lutea*), and the Purple-flowered Devil's Claw (*Martynia louisiana,* syn. *M. proboscidea*) have been declared noxious weeds throughout the State, the following descriptions and illustrations have been prepared to assist in the identification of these weeds:—

Star Burr (*Acanthospermum hispidum.*)

Description.—A branching annual, 2 to 3 feet high, the branches and leaves covered with rough hairs. Leaves opposite, from under 1 to over 2 inches long. Flower heads solitary and sessile in the axils of the leaves. Achenes 5 to 10. Each achene when ripe is about ¼ inch long, oblong in shape, and narrower at the base than at the top; the whole surface covered with short hooked spines and crowned at the apex with two slender hooked spines, one on each side, and about ¼ inch long; the ripe achenes are arranged in groups of 5 to 10, and radiate outwards in the form of a star.

Distribution.—A native of Central and Southern Brazil; was first recorded as naturalised in Queensland by the late F. M. Bailey in 1904 (*vide* this Journal, vol. XV., p. 493). It is now one of the worst weed pests in Northern Queensland, and although odd plants have been noticed as far south as the neighbourhood of Brisbane, it has not manifested itself so far as a bad weed in the temperate parts of the State.

Botanical Name.—Acanthospermum, from Greek *akanthos,* a spine; *sperma,* a seed; in relation to the two sharp spines at the top of the achene ("seed"); *hispidum,* Latin, meaning rough, shaggy, prickly, or bristly.

Properties.—No record can be found of any use made of the plant in South America or elsewhere. It is not known to possess any harmful or poisonous properties. The prickly "seeds," like those of the Noogoora burr and Bathurst Burr, easily attach themselves to the coats of animals, and are thus widely distributed from one place to another.

Eradication.—As the plant is an annual, eradication should be attempted, if possible, by hand-pulling or hoe-chipping before the plants have had time to ripen their seeds. Spraying with an arsenical weed-killing solution should prove satisfactory where the plants are growing thickly together and stock can be kept away from them.

Yellow-flowered Devil's Claw (*Martynia lutea*).

Description.—A rank growing weed with a rather foetid smell, stems and leaves with short hairs clammy to the touch; stems and leaf stalks hollow; leaves large (pumpkin like), round, broader than long, 8 inches or more across, on stalks slightly longer than the breadth of the leaf; flowers in crowded racemes at the end of a long stalk; corolla deep yellow, 1¼ inches across, the throat, mouth and lower lobe of the corolla dotted and streaked with reddish and purplish spots and short

lines. Seed-capsule about 6 inches long, ending in a long curved beak, the outer green covering disappearing and leaving a dry, hard, woody seed vessel covered with sharp prickles and opening in two valves, each valve ending in a long curved hook.

Distribution.—A native of South America. Naturalised in Eastern Australia. In Queensland it is now common on some parts of the Darling Downs.

Plate 106.

STAR BURR (*Acanthospermum hispidum*).—A. Shoot from comparatively young vigorous plant just commencing to carry burrs. B. Shoot from an older plant more branched, bearing smaller leaves and carrying numerous burrs. C. Achene or "seeds."

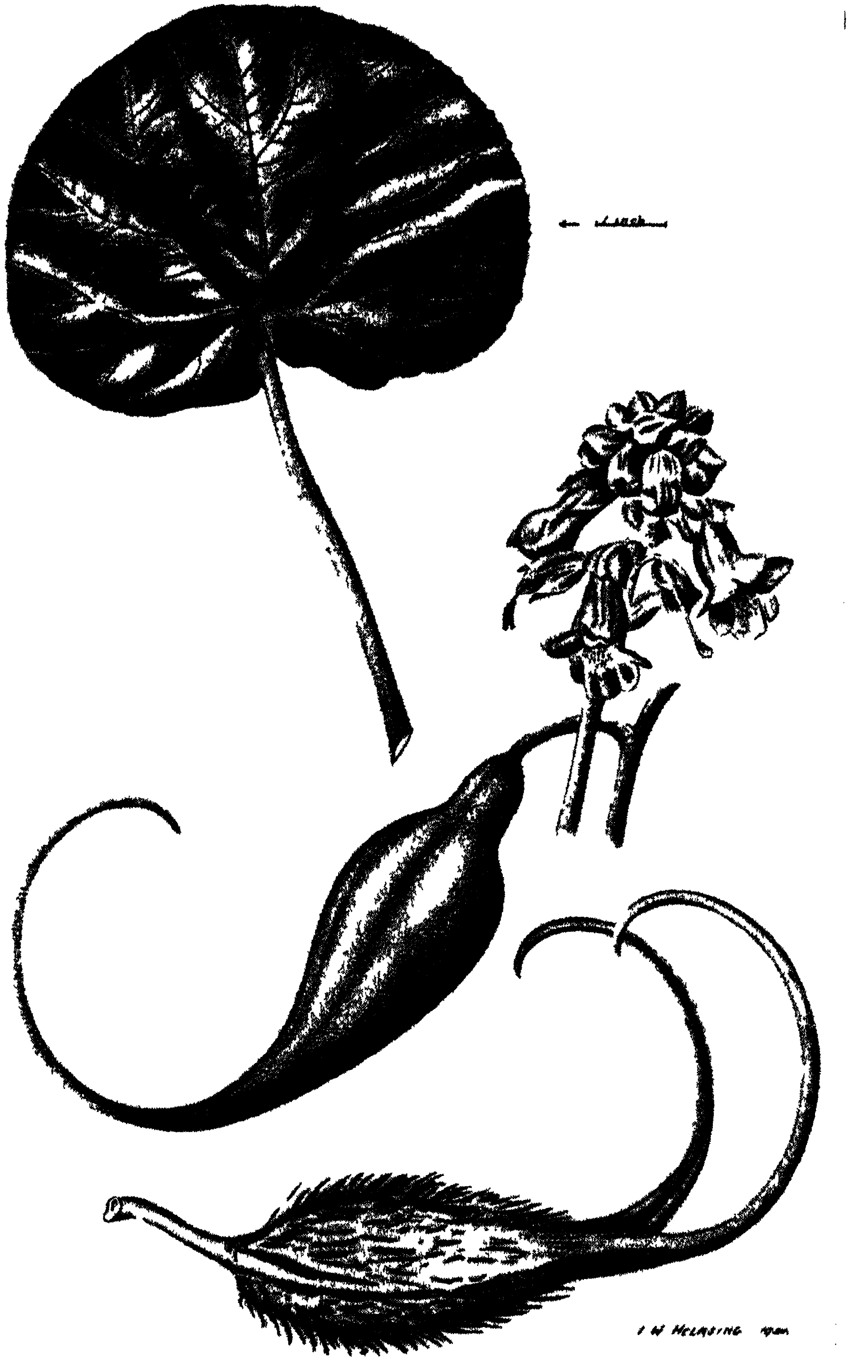


Plate 107
DEVIL'S CLAW (*Martynia lutea*).

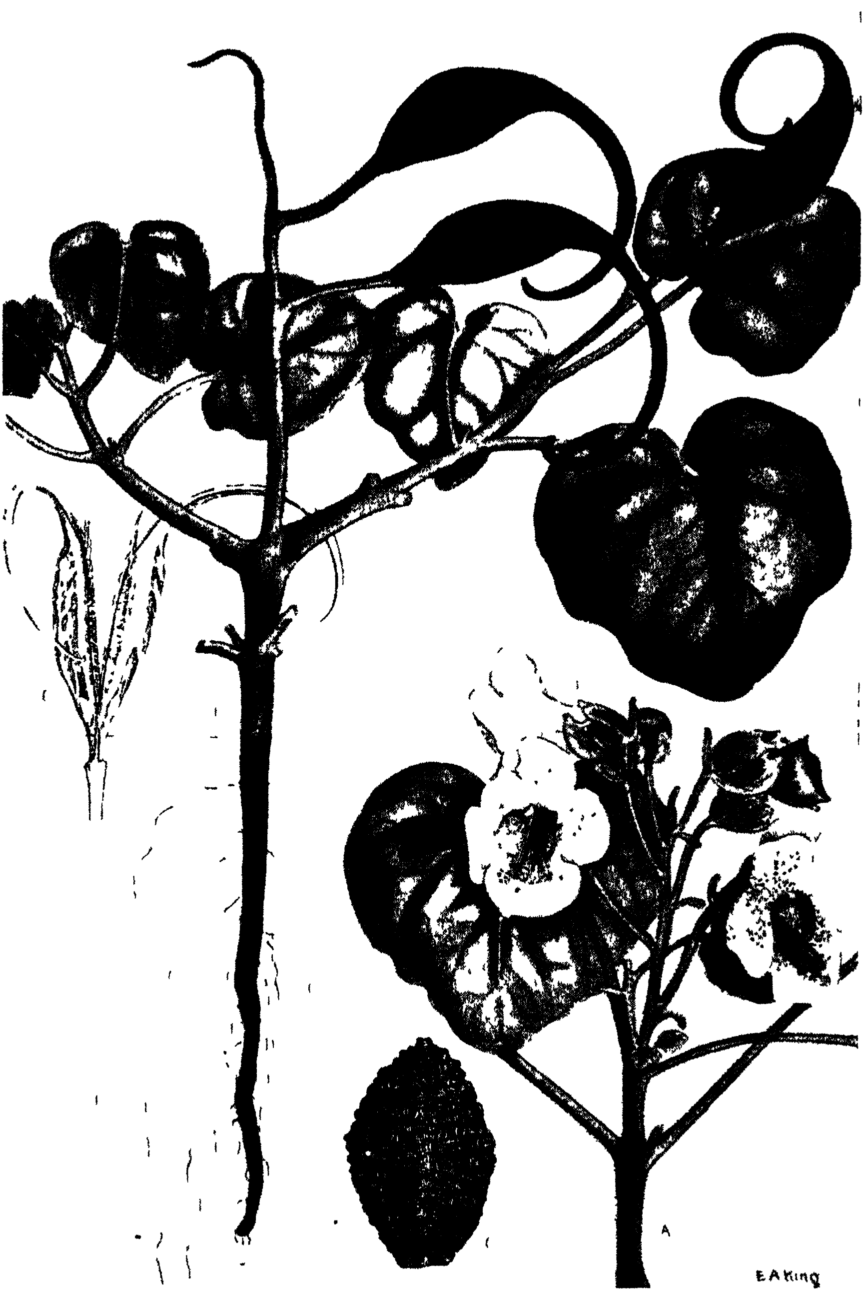


Plate 108.

[*Reproduced from Booklet "Control of Weeds" issued by New South Wales Department of Agriculture in association with New South Wales Rural Bank*

Devil's Claw (*Martynia louisiana*, syn *M. proboscidea*).—A. Portion of plant, showing inflorescence. B. Lower part of plant, showing root system and unopened fruits. C. Seed fully matured, showing ridges. D. Ripe fruit, opened out, with outer cuticle peeled off.

Common Names.—Most commonly known in Queensland as Devil's Claw. Other popular names for it are Unicorn Plant, Elephant's Trunk, Devil's Grip, Ram's Horn, Eagle's Claw, and Double Claw. It also often goes under the name of "Pumpkin Vine," from the pumpkin-like growth of the plants.

Botanical Name.—*Martynia,* after John Martyn, an early professor of botany at Cambridge University, England; *lutea,* Latin, meaning yellow, in reference to the yellow flowers.

Properties.—The spiny, clawed seed vessels become entangled round the hocks of horses and cattle, and in this way the plant is spread from one district to another. The seed vessels often become entangled in the thick wool of sheep, particularly under the neck, and their presence may not be discovered until shearing time, with consequential breakages of the teeth of the shears. The weed is also naturalised in New South Wales, and W. F. Blakely, writing in the "Agricultural Gazette" of New South Wales (Vol. 34, p. 579, 1923), states that men employed in cutting the plant become dizzy after working on it for any length of time. The plant apparently is left quite untouched by stock.

Eradication.—Fortunately, the weed is not very difficult to eradicate, and the usual method of hoe-cutting below the soil level is the most satisfactory one; as the plant is an annual, this should be done prior to the seeding stage.

Purple-flowered Devil's Claw (*Martynia louisiana,* syn. *M. proboscidea*).

Description.—A rank-growing weed, stems and leaves with short hairs, clammy to the touch. Leaves large, round, 3-9 inches across, on long stalks. Flowers in racemes at the end of a long stalk, corolla narrowly bell-shaped, 1½-2 inches long, yellowish white, variegated with green, pale-purple, and violet spots. Seed capsule 5-6 inches long, the outer green covering disappearing, and leaving a hard, dry, woody, seed vessel, with a row of spines along the lower side, and a few shallow depressions on the sides, opening in two valves, each valve ending in a long curved hook.

Distribution.—A native of the Southern United States and Mexico. In Australia it is a naturalised weed in New South Wales, Victoria, and Southern Queensland.

Common Names.—Most commonly known in Queensland as Devil's Claw. The same local names are given to it as to the yellow-flowered *Martynia lutea.*

Botanical Name.—*Martynia,* see under previous species; *louisiana* refers to the fact that the plant was first collected in Louisiana. It is often referred to as *Martynia proboscidea,* but as the name *louisiana* has a number of years priority, it must be used according to the international laws of botanical nomenclature.

Properties and Eradication.—The same as for the previous species.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to this Department without delay.

The Sugar Banana.

THE sugar banana has been grown profitably for all the "bunch" trade markets in Queensland. Small, sweet, and delicately flavoured, this fruit claims many staunch supporters.

For the production of this banana deep, warm alluvial flats, favoured with a generous rainfall or watered by irrigation, are most suitable. As with other varieties, good drainage is essential. As the sugar banana possesses a slender stem, damage by wind must be guarded against, and where there is no permanent windbreak it is worth while establishing one at the time of planting. For this purpose double border rows of lady fingers or sugar banana plants may be planted 7 feet apart in the row and 7 feet between the rows. The spacings in the inner row should actually lie between the spacings in the outside row—i.e., planted according to the septuple system. These two rows close quickly in towards each other and rapidly form an effective windbreak. Of course, the planting of a permanent windbreak of suitable trees would be far more valuable on account of their permanency, provided the cultivated area is reconditioned from time to time.

Prior to planting, the soil should be worked to a depth of at least 12 inches and reduced to as fine a tilth as possible. The holes for the young plants in the plantation area should be 14 feet apart, 15 inches deep, and 18 inches square. The rows should be lined out as straight as possible each way, thus allowing the greatest convenience in working horse-drawn cultivating implements.

Opinions differ somewhat in the matter of selection of planting material, but generally a vigorous young sucker about 4 feet high dug from a matured stool is most favoured. The top portion of the sucker should be removed, leaving a plant of 3 feet in height to place in the hole. The plant is placed in position within the hole and sufficient surface soil placed in around it to fill approximately two-thirds of the actual cavity. The rest of the cavity is filled in gradually as the ground is cultivated during the ensuing year. According to the quality of the soil, one or two followers are allowed to come away, and, normally, the first bunches will be harvested seventeen or eighteen months after planting.

Farmyard manure applied judiciously to sugar banana plantations will repay the grower handsomely. Light horse-drawn implements are satisfactory for cultivating, and green crops, such as Poona and field peas, are excellent soil invigorators, provided they can be turned back into the soil at the correct time—i.e., when still very soft and succulent.

As the sugar banana is usually marketed in the bunch and the fruit possesses a thin, delicate skin, special care in handling is necessary in order to obtain the best market returns.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

DRY conditions prevailed throughout September. The first of the stone fruits—China flat peaches—arrived on the market. New season fruits will soon be offering in abundance. Now is the time for growers to give the final touch-up to the spring cleaning of packing-sheds and equipment. The use of a one-in-twenty (1 in 20) solution of formalin will go a long way towards freeing walls, floors, and shed equipment from possible fungous infection. The time is opportune, too, for full co-operation in marketing methods and procedure. Growers should certainly consider the advice given to them on the careful double-branding of cases, and on having fruit ready in good time for picking up by the carriers, and for delivery at rail sidings, so facilitating checking and stacking. Attention to every detail is worth while, especially from a monetary point of view.

Prices have continued on high levels, and towards the end of September were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Sixes, 8s. to 12s.; Sevens, 9s. to 12s. 6d.; Eights and Nines, 10s. to 14s.; bunch, 1d. to 10d. dozen.

Sydney.—Cavendish: Sixes, 8s. to 12s.; Sevens, 12s. to 15s.; Eights and Nines, 15s. to 18s.

Melbourne.—Cavendish: Sixes, 7s. to 10s.; Sevens, 8s. to 12s.; Eights and Nines, 11s. to 14s.; small grades hard of sale.

Adelaide.—Cavendish: Sixes, 11s. to 15s.

Brisbane.—Lady Fingers, 3½d. to 7d. dozen.

Pineapples.

Brisbane.—Smooths, 1s. 6d. to 6s. dozen; 4s. to 8s. case. Roughs, 1s. to 4s. dozen; 5s. to 8s. case.

Sydney.—7s. to 10s. Quality improving.

Melbourne.—7s. to 10s.

Adelaide.—10s. to 13s.

Papaws.

Brisbane.—Yarwun, 5s. to 8s. tropical case; Locals, 2s. to 4s. bushel; Gunalda, 4s. to 5s. bushel.

Sydney.—5s. to 10s.; specials higher; some lines specky.

Melbourne.—8s. to 12s.; specials higher.

CITRUS FRUITS.

Oranges.

Brisbane.—4s. to 8s.; specials higher.

Sydney.—8s. to 10s. 6d.

Lemons.

Brisbane.—4s. to 10s. bushel.

OTHER FRUITS.

Avocados.

Brisbane.—7s. to 9s.

Sydney.—11s. to 13s.; specials higher.

Strawberries.

Brisbane.—7s. to 14s. dozen boxes.

Sydney.—9s. to 18s. dozen boxes.

Passion Fruit.

Brisbane.—Firsts, 11s. to 14s. half bushel; Inferior, 7s. to 10s.

Sydney.—10s. to 14s.

Melbourne.—12s. to 14s.

Tomatoes.

Brisbane.—Coloured: Redland's Choice, 11s. to 14s.; small, 6s. to 10s.; Ripe, 6s. to 10s.; Green—Bowen, Yarwun, 7s. to 12s.

Sydney.—South Queensland, 10s. to 18s. half bushel; Bowen, 6s. to 12s.; some specials higher.

VEGETABLES.

(Brisbane prices only, unless otherwise stated.)

Beans.—Brisbane, 5s. to 12s. bag; Sydney, 4s. to 12s. bushel; new crop, South Queensland, to 16s.

Peas.—Brisbane, 10s. to 12s.; inferior lower.

Cauliflower.—8s. to 12s. dozen.

Cabbage.—2s. to 8s. dozen.

Carrots.—3d. to 1s. 6d. bundle.

Beetroot.—4d. to 1s. bundle.

English Potatoes.—Small, 3s. to 3s. 6d.; quality to 5s. 6d.

Sweet Potatoes.—2s. to 3s. 6d. bag.

Cucumbers.—12s. to 18s. bushel.

Rhubarb.—9d. to 1s. bundle.

Marrows.—1s. to 5s. dozen.

Pumpkins.—5s. to 7s. bag.

[*Photo: Mrs. Green.*

Plate 109.

MOWBULLAN HOUSE, BUNYA MOUNTAINS.—The Bunya Range, of which Mount Mowbullan is the highest peak (3,604 feet), divides the river systems of the Burnett and the Condamine and other streams in South-eastern Queensland, which form the headwaters of the great Darling River System. From Mowbullan spreads what is probably the widest panorama on the Continent of Australia, embracing the whole of the Darling Downs and the North-eastern border ranges of New South Wales. Looking northward, the view extends over the whole of the South Burnett to the Kinbombi and coastal range. North-westward, parts of the Dawson Divide may be seen in clear weather. The Bunya Mountain Reserve—beautiful jungle-covered country containing age-old stands of Bunya Pine—is one of the scenic glories of Queensland.

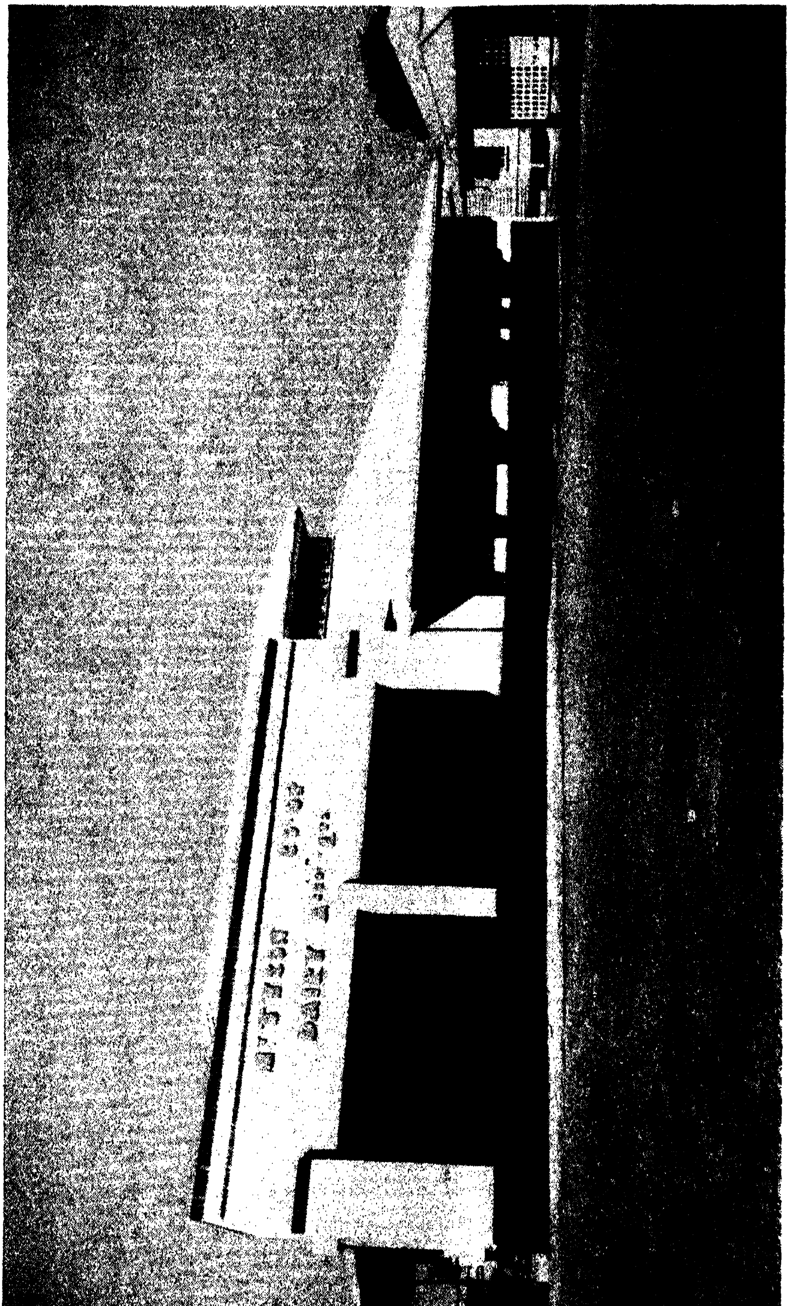


Plate 110.

MOUNT TYSON CHEESE FACTORY.—Equipped completely with a modern plant, this Darling Downs factory has set a very high standard in cheese manufacture and general co-operative dairy organization.

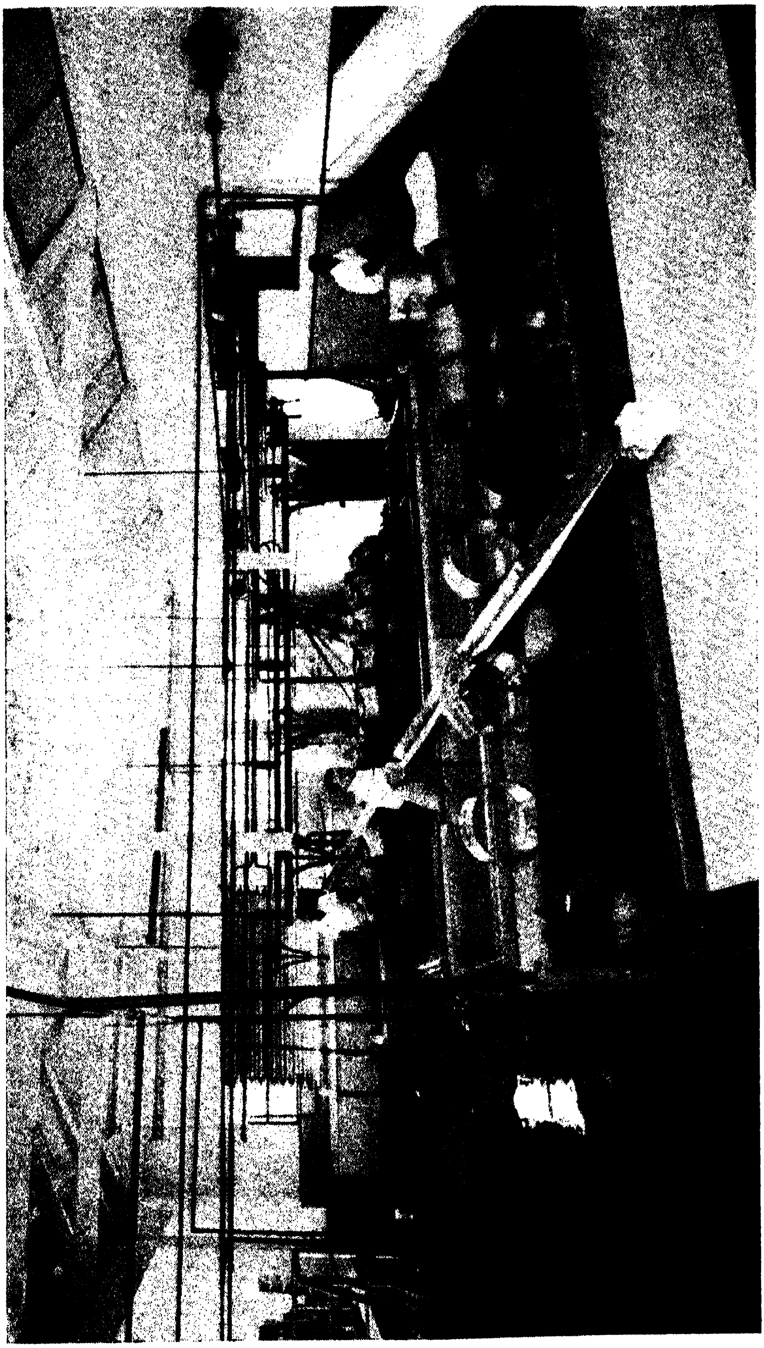


Plate 111.

Filling the Vats, Mount Tyson Cheese Factory.—High quality milk supply, coupled with factory efficiency, and, consequently, sound hygienic practice in cheese-making ensures the maintenance of a high standard of production at Mount Tyson, the centre of one of Queensland's most progressive dairying districts.

General Notes

Staff Changes and Appointments.

The following transfers of inspectors under *The Diseases in Stock Acts, The Slaughtering Act,* and *The Dairy Produce Acts,* have been approved:—

Mr. J. P. Dowling, from Dalby to Bowen;
Mr. A. G. Smyrell, from Bowen to Dalby;
Mr. G. R. Sigley, from Biggenden to Toowoomba;
Mr. G. F. E. Clarke, from Kingaroy to Biggenden;
Mr. D. A. Bacon, from Mareeba to Woodbine;
Mr. E. E. Prenzler, from Doboy Bacon Factory to Mareeba;
Mr. W. F. L. Snewin, from Oxley Bacon Factory to Helidon;
Mr. W. Kleinschmidt, from Oxley Bacon Factory to Ravensbourne.

Mr. K. D. Hoffman, inspector, *Diseases in Plants Acts,* and agent, *Banana Industry Protection Acts,* has been transferred from Nambour to Gympie.

Mr. O. C. Baumgart (Island Plantation, Maryborough) has been appointed canegrowers' representative on the Maryborough Local Sugar Cane Prices Board. Mr. B. A. Ernest has been given a similar appointment on the Rocky Point Local Board. The former appointment has been made in the place of Mr. G. J. Briggs, resigned, and the latter in place of Mr. T. W. Bray, also resigned.

Messrs. G. Hall and D. Sanders, Mount Isa, have been appointed honorary protectors of fauna.

Constable R. W. Brown, Yungaburra, has been appointed also an inspector under *The Slaughtering Act.*

Butter and Cheese Boards.

Orders in Council have been issued under *The Primary Producers' Organisation and Marketing Acts* giving notice of intention to extend the operations of the Butter and Cheese Boards for the period from 1st January, 1942, to the 31st December, 1944. A petition for a poll on the question of whether or not the Boards shall be extended for such period may be lodged by growers on or before the 13th October, 1941.

Pool Boards.

Regulations issued under *The Primary Producers' Organisation and Marketing Acts* provide for optional preferential voting at any referendum or election held in connection with commodity boards.

Sugar Levies.

Regulations issued under *The Primary Producers' Organisation and Marketing Acts* empower the Cattle Creek Mill Suppliers' Committee to make a levy at the rate of ¼d. per ton on suppliers of sugar-cane to the Cattle Creek Mill, such levy to be used for the purpose of meeting the cost incurred by such Committee in connection with Farm Peak appeals and the costs incidental thereto; 50 per cent. of the growers concerned may, on or before 1st September, 1941, make a petition for a poll on the question of whether or not the levy should be made.

Additional Regulations under the abovementioned Acts empower the Innisfail District Cane Growers' Executive to make a levy at the rate of ½d. per ton on suppliers of sugar-cane to the mills in its district, such levy to be used for building fund purposes by the Innisfail Executive. At least 50 per cent. of the growers concerned may, on or before 1st September next, make a petition for a poll on the question of whether or not the levy should be made.

Margarine Regulations.

Regulations have been issued under "*The Margarine Acts,* 1910 *to* 1939," which rescind all existing regulations. The new regulations provide, amongst other things, for the registration of factories, the issue of licenses to prepare, manufacture, or pack margarine, the disposal of condemned margarine, the taking of samples for analysis, the registration of marks used by owners for margarine, and the construction of factories.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

"Flaveria."

N.M. (Winton)—

Your specimen represents *Flaveria australasica*, a plant that is very widely spread over the black soil plains of Queensland. It finds its greatest development in Western Queensland, but is also seen on the Darling Downs, in the Dawson Valley, and a few other places near the coast where patches of black soil country occur. We have not heard a common name applied to it, but the generic one "Flaveria" is short enough for general usage. The plant is not known to possess any poisonous or harmful properties, though we cannot say we have ever seen it eaten by stock.

Maté—Vinca Rosea.

J.G. (Kunwarara)—

The Maté Plant, so far as we know, is not found in Queensland, either wild or in cultivation. We have imported seeds at odd times from South America, but have had no success with them. There are one or two smallish bushes, we think, in the Botanic Gardens, Sydney. The plant is confined to Paraguay, Uruguay, Argentine, and Chile in South America. It is the national beverage of that continent in much the same way as tea is here. It is exported and sold, and is obtainable in Brisbane at the larger department stores.

The plant mentioned by you as a cure for diabetes and common in North Queensland is probably *Vinca rosea*. It is probably quite common with you on Marble Island. It grows wild on most of the sea beaches from Bundaberg northwards. A pamphlet on it has been sent to you.

A Native Millet. Tassel Blue Grass. A Gulf Country Grass.

W.W. (Gilliat)—

The stout grass with large panicum-like "seeds" is *Echinochloa Turneriana*, a Native Millet. It is closely allied to, and in many respects resembles, the well-known cultivated crops Japanese Millet and White Panicum. In the Gulf country, Native Millet is fairly common around waterholes, and in other similar situations. It becomes less common southward, although it has been recorded from as far south as Charleville. It is generally regarded as a good fodder species, and, in fact, you would expect this from its close affinity to the previously-mentioned cultivated fodders.

The next specimen, with a hairy, much-branched seed head, is *Dichanthium superciliatum*, Tassel Blue Grass. The individual rays of the seed head resemble those of the ordinary Blue Grass, but there are many more of them in the seed head, hence the Tassel Blue Grass. It is also a much taller and more robust grass than the common Blue Grass. It is fairly common in the Gulf country and extends southwards into the Central-West to some extent. We have no information regarding its palatability, but it should be quite a good grass, though rather coarse at maturity.

The third specimen, a short grass only about 1-1½ feet high, and with the seed head composed of a single, fragile spike, is *Uranthoecium truncatum*. We have no common name for it. This generally grows on lower lying flats, and at times is very thick, though often it is mixed with one of the Star Grasses and Button Grass. It is mainly a Gulf country grass, but does extend slightly into the Central-West. A report from the Hughenden district suggests that it should be quite a useful grass in the depressions and flats, but we have no definite information on its fodder value.

Rural Topics

Disease Costs Money.

If each of us could have presented a bill for disease among our live stock over a period of years, we should probably have the shock of our lives, for the fact is that farmers, as individual business men, do not realise what disease among animals is costing them (says an English farming journal). What we pay the "vet" is the smallest part of the bill. The greater proportion is that which we cannot always see in terms of hard cash—short herd life, empty cows, slipped calves, and diseased quarters. We have been content in peace time with a productive life of only three years in our dairy herds—three years when there are individual cows in certain herds that have given yields of 1,000 gallons a year for ten years. Disease is computed to cost £19,000,000 a year over the whole country. Interpreted to the individual herd, that means that disease is costing the ordinary milk producer nearly as much as labour or feeding stuffs. The toll of disease is, in fact, one of the penalties of bad farming. No man may claim to be a good farmer unless he takes every possible step to safeguard the health of his cattle. And if he is wise he will do that by preventive rather than by remedial measures. Prevention is always better than cure, and in this case it is far more economical.—*The New Zealand Farmer Weekly.*

What a Giant Toad will Swallow.

Some years ago some giant toads—*Bufo marinus* is the scientific name—were brought to Queensland from the West Indies to help in settling the cane beetle problem in the North Queensland sugar areas. They were let go around Gordonvale, Babinda, and Innisfail, where they found local conditions very agreeable, and multiplied exceedingly. Their appetite for cane beetles soon proved prodigious, but they developed an appetite for other insects and pests as well. To find out how the giant toads had extended their menu, over a hundred of them were collected recently in the Hambledon canegrowing area and opened up for inspection. The examination of the stomach contents of the toads showed that, while a few greyback cane beetles had been swallowed, the number of Frenchi beetles counted encourages the belief that the toad is doing a useful job in controlling the beetle pest. Not only that, but some canegrowers say that the giant toad has developed a huge appetite for beetle borers and for garden pests generally. And here is a very interesting discovery—where the toad is numerous there has been a remarkable decrease in snakes and death adders, and this is believed to be because by swallowing a toad the reptiles commit suicide. Evidently, the toad, good on the swallow himself, is too tough for digestion when swallowed by a snake. Perhaps, in the jargon of the day, snakes are allergic to toads.

A Farmer's Philosophy.

"You know," said one of our readers recently, "there is a stability and sanity about the land. The farmer has his full share of problems and anxieties—especially the dairy farmer who is faced with the necessity of changing over from butter to cheese manufacture—but he has his compensations, and never were these compensations to be valued more than in these hectic days. In a world of tumbling standards, it is well to be daily reminded of the eternal verities, and nowhere is the rhythm of things eternal so accented as in the places where men are quietly busy with their crops and sheep and cattle; nowhere, surely, are there more within reach the makings of a worth-while way of life." There is certainly something fine in that philosophic viewpoint.

Shipping Dairy Produce without Refrigeration.

A small experimental shipment of Australian butter and cheese is now on the way to England as part of a joint Australian and New Zealand policy for testing methods of sending dairy produce to distant markets by ships without any very large refrigerated space. Under this scheme, a consignment of butter and cheese from New Zealand was recently delivered in London. While it was found that the butter was not of the required quality, the cheese opened up well, both from the viewpoints of analysis and expert grader's taste. The cheese was sent, firstly, in crates, and, secondly, packed in sawdust. The sawdust packing gave the best results. There is not enough evidence yet, however, on which to build up any great hopes of similar success with bulk consignments, but the science men are continuing with the good work.

Farm Notes

NOVEMBER.

WHEAT-HARVESTING will become general this month, and now is the time to see that all field equipment—header-harvesters, tractors, and other machinery —is in thorough working order. All working parts should be oiled and examined and necessary readjustments made so as to avoid the risk of stoppages in busy times.

Rust is not the menace that it used to be, now that more or less rust-resistant wheats are in general cultivation. Three Seas and Seafoam wheats are moderately resistant, while other varieties—such as Flora and Florence—usually ripen early enough to escape rust.

November is regarded as the best time for the establishment of the main maize crop, because the tasselling period coincides usually with normal summer rains. Too much attention cannot be given to the preparation of land for maize, which should now be well advanced, for no amount of inter-row cultivation will overcome the retarding influence of faulty initial preparation. Inter-row cultivation should become progressively shallower as growth proceeds, and may be discontinued at the cobbing stage.

Increased attention is being given to the growing of grain sorghums, chiefly in districts where the rainfall is insufficient to assure profitable yields from maize. Yields up to 12 bags to the acre have been obtained under conditions fatal to maize, while the capacity of header-harvesters to deal with the new dwarf-growing varieties is a big factor in economical production.

For intermediate crops, the rapidly maturing millets, Japanese millet and white panicum, can be recommended for present sowing, being suitable for grazing, silage, or hay. If seed production is desired, preference should be given to the variety known as Giant Panicum or Giant Setaria, and to the French millet.

Local potatoes and onions will now be arriving on the market, and, in order to obtain the best possible returns, attention should be given to grading, and to marketing produce in good, clean bags. To retard infestation by the potato tuber moth, the potatoes should be bagged and removed from the field without delay, for if exposed overnight, some infestation may occur during storage.

The planting of peanuts will be continued in the main South Burnett districts, where Virginia Bunch and Red Spanish are the principal varieties grown. Growers are reminded of the better germination obtainable if seed is treated with a fungicide before sowing.

In addition to the crops mentioned, seasonal sowings of Sudan grass, broom millet, buckwheat, pumpkins, and melons can be made, and cow cane and sweet potatoes planted out.

Where broom millet is grown as a sideline, it is sometimes preferable to make small successive sowings so as to spread the harvesting over a long period.

Orchard Notes

NOVEMBER.

THE COASTAL DISTRICTS.

Citrus Fruits.

In the citrus orchard increasing temperature and the possibility of a dry period call for the utmost attention to soil conditions, particularly aeration and moisture conservation. At the slightest sign of distress because of lack of moisture, trees should be irrigated thoroughly whenever water is available. At the same time attention should be given to cultivation, particularly on hillside orchards. In the coastal districts, the possibility of the approach of storms will prompt growers to consider the completion of each cultivation by forming shallow drains for running off excess water and preventing soil loss.

The incidence of mites, the direct cause of the darkening of the skin of the fruit, a condition known as "Maori disease," is another matter for observation. Usually the first indication of the trouble is when, with the sun shining on it, the fruit has the appearance of being covered with a grey dust. If examined with a good lens, the skin will be seen to be covered with numerous yellow slug-like insects which are living on the skin.

Under certain weather conditions scale movement may be expected.

Detailed information regarding insect control may be obtained from departmental publications on the subject. Every fruit and vegetable grower should have the Agricultural and Pastoral Handbook, Vol. III. (Insect Pests and their Control, Plant Diseases and their Control), obtainable from the Department of Agriculture and Stock. Price 3s., post free.

Pineapples.

Continue planting pineapples as discussed in these notes last month, always remembering that the modern practice is smaller areas, close planting with more pineapples to the acre, quicker, better, and healthier growth, and finally better fruit by liberal fertilizing through the leaf bases with 10-6-10. Collectively, these practices tend towards the elimination of wilt.

Bananas.

New Plantings.—November and December are very suitable planting months in most districts. Just as modern methods have brought about great improvements in pineapple culture, so they might be applied in principle to banana-growing. Smaller areas and large production per acre should cut overhead costs, lighten labour, lengthen the profitable life of the plantation, and reduce the time of waiting for the crop. To this end, select planting material with care, plant in large holes, and break up the ground as soon as possible after planting. To prevent the loss of top soil by erosion and to provide the bananas with a cooler and moister environment, plant a cover crop as soon as the weather permits and initial weed growth has been suppressed. This will hold the loose surface soil during the summer rains.

Young Plantations.—The correct follower or followers for each plant should be selected, if not already done, and all additional suckers suppressed. Cultivate to conserve moisture, and mulch with a cover crop. A complete fertilizer will improve the coming crop.

Old Plantations.—De-sucker to one follower to each plant. Apply a complete fertilizer, if not already done, and cultivate to conserve moisture.

General.—Bait for borers; be prepared for caterpillar plagues; watch for bunchy top.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, for if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth.

Spraying for codling moth should be continued, and all pip fruit trees should be bandaged by the beginning of the month; further, the bandages should be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is a cause of the increase in this serious pest in the Granite Belt, and growers are warned that they should pay more attention to the destruction of this pest if they wish to grow pip fruit profitably.

Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once. Unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action should be taken to combat this—the most serious—pest of the Granite Belt, and growers should realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry.

A sharp lookout should be kept for brown rot in fruit, and, on its first appearance in a district, all ripening fruit should be sprayed with lime sulphur 1 in 120.

All grape vines, potatoes, and tomatoes should be sprayed with Bordeaux or Burgundy mixture, as required, for the control of downy mildew and anthracnose of the grapes, and Irish blight and target spot of the potato and tomato.

CARE OF THE YOUNG FRUIT TREE.

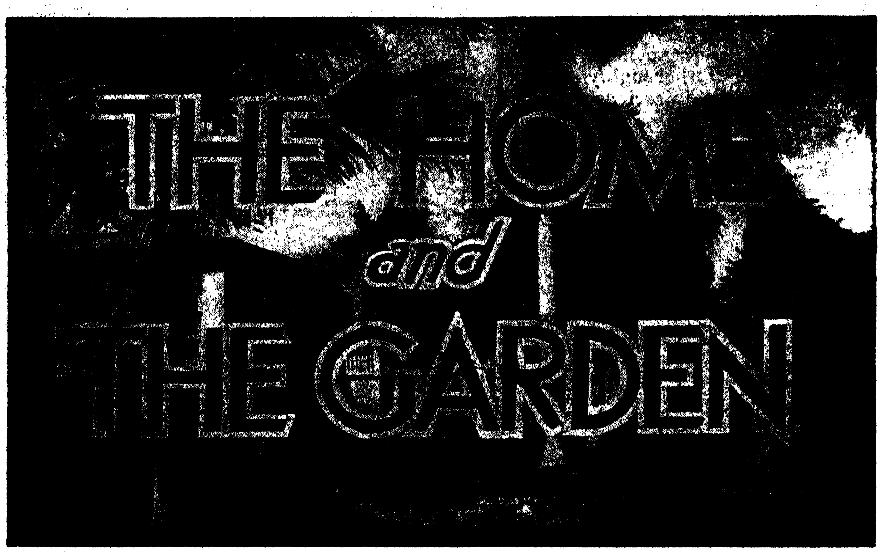
Many failures are observed where replacements are made in a bearing deciduous fruit orchard. Frequently, the young tree remains like an unwanted orphan and shows only stunted growth. If it is to catch up to the other trees and fill in an unsightly and unprofitable blank space in the orchard, careful attention must be given to all details in its management.

The main causes of failure are:—

1. The lack of natural plant food for the young tree.
2. If the old replaced tree died from the attacks of some particular diseases, the replant may be attacked in turn and suffer an initial setback.
3. Searching roots of adjacent trees may compete successfully with those of the young tree for the available plant food.
4. Lack of attention.

When digging out the unhealthy tree, carefully remove and burn all the roots together with the tree. Leave the hole open and exposed throughout the winter, and just prior to planting in spring fill with a load of virgin soil to which may be added some well-rotted animal manure. Virgin soil is obviously richer in plant nutrients than soil which has been cropped exhaustively for some considerable time.

The young tree is very often forgotten and does not get the necessary attention at the right time. Weed growth may tend to choke it, but this difficulty can be simply overcome by the use of an old fertilizer bag. The bag is opened out and, after making a cut in the middle, is slipped over the young tree. This makes an excellent mulch which keeps down weed growth in the vicinity of the tree and conserves the moisture so necessary for its progress.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

THE VALUE OF SUNLIGHT.

IN our talk last month we told you what a great asset our wonderful Queensland sunshine is in helping to keep children well and making them grow straight and strong. We explained that the sunshine acts in two ways—by destroying the germs of disease and by helping the body to make use of the necessary minerals which build up bones and teeth. This month we are going to talk about sun-bathing, and discuss various special points in connection with it.

In the last few years there has been a great craze for sun-bathing, or sun-baking as some people call it. We see it going on everywhere on our beaches during the summer months. This is a good thing, but, like every other good thing, one can have too much of it, and, like every other medicine, it should be taken in moderation.

This is especially so with babies and young children, and we have seen many babies badly sunburnt because mothers had not been properly instructed in the management of sun-bathing.

The most valuable part of the sunlight is what we call the ultra-violet rays—just too high in pitch for our eyes to see. Ordinary glass, which does not arrest the visible rays, stops the ultra-violet. Therefore, we cannot get the best effects of the sunlight if the windows are closed. Unfortunately, smoke acts like glass, and cuts off the very rays we need the most. So the best way to use the sunlight is in the garden, on a well-protected verandah, or in a room with the windows wide open and in a clear atmosphere.

How to Use the Sunlight.

The best time to begin sunbaths is now—in the first warm weather and before the sun reaches its full summer heat. The early morning hours are best, because it is the light and not the heat which is important. As we know, too much heat can be enervating and depressing.

Sun-bathing may be commenced when baby is quite young, but it is difficult to give definite directions as to the extent of the body surface that can be exposed to the sun or the best time allowance. In babies, as in grown-ups, there are very great differences in the sensitiveness of the skin to the sun's rays. The safest and best plan in this, as in all other matters affecting baby, is to go slowly and err on the side of advancing too slowly rather than risk going too quickly.

When a normal healthy baby is about a week old he may be taken out into the sunshine for a short time if the weather is mild. His eyes should be shaded from the glare by turning him on his side in his cot and shading his head without putting a covering near his face. Remember that the ideal sunshade is a tree, shrub, or hedge, such as animals instinctively seek on hot days. Next best is a verandah or wall.

When the temperature of the day is fairly warm a healthy baby who has been properly reared should become accustomed towards the end of his second month to having his arms and legs bared to the sun for, say, five to ten minutes before the 10 a.m. feeding, and in the course of another week or two before the 2 p.m. feed also. By degrees his sunbath may extend to the waist, and later to the armpits.

The mother should hold the baby on her knee if possible, so that while he is being sun-baked she can give him stimulation and passive exercise by stroking his legs and arms gently but firmly, starting at the hands and feet and working towards the trunk. This increases the activity of the circulation. It is not wise to leave baby in his cot for his sunbath, particularly in the beginning, as a busy mother may easily lose count of the time.

In hot weather a healthy baby in his third month may have his morning bath on the open verandah, where the sunshine can play on his body.

When he is old enough to crawl and run about, exposure of the whole body to the sunlight from ten to fifteen minutes or more may be allowed.

During the holidays or if baby lives by the seaside and has been accustomed to sunbaths, mother may safely let him run about the beach for a time in a very scanty sun suit or loin cloth.

Be careful in all cases to protect the head and eyes.—The best head covering is a loose, white, perforated soft-linen hat, which may be lined with green. This keeps the head reasonably cool and shades the eyes and the back of the neck.

Warning.

While the normal baby benefits to a considerable extent by a gradual exposure to the sunlight, parents must realise that the sun's rays can do more harm than good if any attempt is made to proceed too quickly or if the sunbaths are commenced in really hot weather. Watch baby carefully. The faster the skin tans the more you can expose it, but the baby with the fine sensitive skin, which reddens or freckles instead of tanning, must be taken very slowly indeed—commencing with perhaps only one or two minutes until the skin can be educated to react properly.

Sunlight is Essential.

We know now that during the last few years a series of very important investigations has definitely proved that failure to expose the skin surface to direct sunlight is one of the principal causes of debility and disease. Seeing what wonders direct sunlight can do for children in general, it is becoming more and more apparent that we have all been to sparing of sunlight for babies. We are proving every day that they benefit as much as the older children of the family from exposure of the skin to the sun's rays. Babies accustomed to daily exposure of the skin to open air and sunshine do not "catch cold" easily. If, in addition to their sun and air baths, they are given a sufficiency of all the foods necessary for good health they become practically weatherproof and almost diseaseproof. Such children are a joy to themselves and to everyone connected with them. Their circulation will be good and they will glow with warmth even on cold days.

In our centres we find that many babies living in flats and apartments become very pale owing to lack of sunshine. Mothers who are compelled to bring up their children in these limited surroundings must use every means of getting them into the fresh air and sunshine, and if it is not possible in the house and no garden is available, there are always the public parks and gardens which may be utilised. Remember, babies and children—in fact, all living things—need the sunshine. Spare no effort to obtain it for your children.

You can obtain information on this or any other matter relating to the feeding and management of children up to school age by writing to "Baby Clinic, Brisbane." Such letters need not be stamped.

IN THE FARM KITCHEN.

A MIXED MENU.

Buttered Eggs.

Parboil 1 or 2 large potatoes and cut into slices about ¼ inch thick. Dip in beaten egg and fry in boiling fat until a golden brown. Drain and place in a moderate oven to keep hot and to cook a little longer while the eggs are being prepared. Break eggs into a saucepan with 1 tablespoon top milk, allowing 2 eggs per person. Add 1 dessertspoon butter, pepper, salt, and a little finely-chopped parsley. Stir over gas until mixture thickens, but on no account allow eggs to become hard. Pile on to prepared potato slices, sprinkle top with shredded and fried bacon, and serve at once.

Salmon Loaf with Lemon Sauce.

Skin and flake 1 large tin salmon, add 1 cup fine white breadcrumbs, 4 chopped gherkins, 1 teaspoon minced onion, the grated rind of 1 lemon, 1 teaspoon finely-chopped parsley, 1 cup thick white sauce, 2 well-beaten eggs, ½ cup milk, salt, pepper, and a little paprika or a wash of cayenne to taste. Press into a well-greased loaf pan and bake in a moderate oven for about 30 minutes. Turn out and serve with lemon sauce.

Vegetable Puff.

Mix together ½ cup each cooked and diced carrots, celery, and cooked peas, 1 cup diced and fried onions, 1 tablespoon each finely-chopped green pepper and parsley, pepper and salt to taste, 2 cups very finely-mashed potato, 1 tablespoon melted butter, and the yolks of three eggs. Mix well together without breaking the vegetables, and lastly add the whites of the 3 eggs, beaten to a stiff froth. Pile lightly in a casserole or any fireproof dish and bake in a moderate oven for about 45 minutes. This is an excellent way to use up left-overs such as fish, chicken, cold meat, &c.

Sweet Potato Loaf.

Sift 2 level cups plain flour with 2 heaped teaspoons baking powder, ¼ level teaspoon bicarbonate of soda, ½ level each teaspoon salt, ground cinnamon, and ground nutmeg; add 2 cups fine wheatmeal, 1 cup each chopped walnuts and sultanas or raisins, ½ cup coconut. Cream ½ cup butter well, add 1 cup honey, and 1½ cups grated sweet potato, then 2 well-beaten eggs. Lastly add dry ingredients and mix well. Turn into a well-buttered and lightly-floured loaf pan and bake for about 1½ hours in a moderate oven.

Fish Loaf.

Boil as many potatoes as required and mash well with a little butter, milk, and the yolk of 1 egg, but do not make too sloppy. Grease a flat tin or oven slide and place on potato, forming it into a neat oblong shape and rather high. Scoop out the centre, leaving a case, but take care to have potato rather thick on the bottom. Now mix together 1 lb. flaked cooked fish, 1 cup well-flavoured white sauce, tomato or lemon sauce, 1 tablespoon chopped parsley. Fill hollow and cover with potato. The potato may be forced through a pipe in a design on top, but care must be taken that all the fish mixture is well covered. Brush over with a little beaten egg and bake in moderate oven to get thoroughly hot and well browned. Lift carefully on to a hot dish and serve. This may be cooked in a flat casserole dish and served in the same dish in which it was cooked.

Macaroni and Fish Cutlets.

Cook and flake fish and measure about 1 lb. Cook 4 oz. macaroni or spaghetti in plenty of boiling salted water until tender, drain well and chop finely. Melt 2 oz. butter or margarine in a saucepan, add 2 oz. butter, cook a little, and gradually add a little more than 1 cup milk and stir until very thick. Remove from gas and add pepper, salt, the grated rind of 1 lemon, a dash of paprika. and 1 tablespoon lemon juice. Add fish and macaroni and mix well together without breaking the fish too much. Form into cutlet or pear shapes, roll in flour, then in egg and breadcrumbs. Fry in boiling fat until a golden brown, then drain and serve with a well-flavoured lemon sauce. Lobster or prawns may be used in the same way.

IN THE FARM GARDEN.

FOLIAGE PLANTS FOR THE GARDEN.

Dr. D. A. HERBERT.

AT certain seasons of the year when flowers are scarce, the full merit of plants whose ornamental value lies in their foliage is realised. There is a tremendous range of plants of this type; some of them, such as the Coleus, are so common that their worth is not fully appreciated, while others, such as Aucuba, the gold-dust tree, have to be coddled if they are to survive in the average Queensland garden. Some idea of the effective use of foliage is given by the bank of Monstera and tree-ferns along the Adelaide street frontage of the Brisbane City Hall. *Monstera deliciosa* is a noble vine with great perforated leaves of jungle green, and is at its best climbing on a building or up a tree trunk, and contrasts well with the feathery foliage of the ferns. In a small garden a display of this sort must be on a reduced scale, but there are many ferns and shrubs which can give just as pleasant an effect by a blending of forms of leaf and shades of green. The most satisfactory alternative to a flower display is, however, provided by plants with coloured foliage. One of the finest coloured foliage plants is the Croton, which is seen at its best in the North. There is something intensely alive in its vivid colouration, and though at its best in the tropics, it does remarkably well in the south of the State, especially if it is protected from drying winds, Cuttings strike readily in water or in soil.

Another fine foliage plant is the Acalypha, but here again the full beauty of the numerous varieties is best seen in the North. In Flinders street, Townsville, there is a splendid range of colours and leaf shapes, but, unfortunately, in South Queensland there are far too many poor varieties grown, and they bring discredit on the good ones. Many of them should have been discarded long ago. A row of good Acalypha varieties makes a fine show against a fence or along a drive. If they are kept clipped, they make a good hedge, but cannot show the full beauty of their foliage.

The Coleus is very hardy and strikes so easily that most gardeners are content to raise their plants from cuttings. It grows readily from seed, and it is worth while raising a batch of seedlings occasionally, because in that way new colours and leaf shapes are obtained. Old plants become leggy and, apart from that, are liable to the attacks of eelworms, which make lumps on the roots; so it is advisable to start new plants from cuttings each year. The best species is that familiar in Queensland—*Coleus Blumei*—but from time to time other species find their way on to the market, and none of them is as good as the old type. A plant which can be grown like a Coleus and which makes a bright splash of colour is Iresine, a native of South America, sometimes locally known as Bull's Foot. It has round leaves notched at the apex and highly coloured. One variety has purplish red stems and leaves the colour of beetroot, and another has one side of the leaf purplish red and the other green and yellow. Cuttings from branches which occasionally sport different colour markings will give plants with the new character. Iresine is very hardy and will stand drought but not frost. If it is kept cut it makes a dense bush, and overseas is used for carpet bedding, the plants being put out 6 to 10 inches apart and kept cut.

A very hardy foliage plant is Sansevieria, the Bowstring hemp, a plant with a very strong fibre. It has a creeping stem from which arise stiff, erect, sword-shaped leaves, mottled with transverse bands of greyish white. It grows well in rockeries. If leaves are cut and the pieces put in sand they root in the course of a few weeks, but it is quicker to divide up an old clump.

The Dracaenas are one of the finest of the groups of foliage plants. Most of them have slender woody stems bearing a palm-like crown of broad leaves, often highly coloured or variegated. We are fortunate in Queensland in being able to grow them in the open garden, whereas in many countries they must have artificial heat. Most of the Dracaenas of gardens are really members of the genus Cordyline, but the difference is not great. *Cordyline terminalis,* the palm lily of our scrubs, a tall plant with green leaves, is not commonly cultivated, but it has a number of varieties, some with purple leaves, others with white, pink, or rose variegation. The purple varieties are specially popular, and there is no difficulty in getting them to strike. When the plants get too tall they can be cut down, the top divided into small slips and planted, while the stump grows out again. A New Zealand species, *Cordyline australis,* the cabbage-tree palm (a name also given to some of the true palms) is distinguished from *Cordyline terminalis* by absence of a leaf stalk. Its leaves are often striped with yellow. These so-called Dracaenas make good pot plants in their early stages, and when they get too tall they can be transplanted to the open garden bed, or cut back for cuttings.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1941 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1941.	Aug., 1940.
	In.		In.	In.
North Coast.				
Atherton	0·86	40	0·59	0·64
Cairns	1·67	59	1·63	0·61
Cardwell	1·23	69	1·02	0·38
Cooktown	1·17	65	2·18	1·16
Herberton	0·62	55	1·18	0·30
Ingham	1·44	49	0·75	1·86
Innisfail	4·90	60	2·67	3·52
Mossman Mill	1·23	28	1·24	0·35
Townsville	0·51	70	0·02	2·32
Central Coast.				
Ayr	0·59	54	0·04	3.65
Bowen	0·73	70	0·76	7·84
Charters Towers	0·52	59	0·07	1·44
Mackay P.O.	1·09	70	0·27	7·09
Mackay Sugar Experiment Station	0·98	44	0·15	6·76
Proserpine	1·49	38	1·14	6·68
St. Lawrence	0·81	70	Nil	2·81
South Coast.				
Biggenden	1·08	42	0·18	0·29
Bundaberg	1·30	58	0·42	0·93
Brisbane	1·93	89	0·75	0·40
Caboolture	1·66	65	0·25	1·24
Childers	1·25	46	0·63	0·79
Crohamhurst	2·21	48	1·37	4·01
Esk	1·41	54	0·25	0·24

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records	Aug., 1941.	Aug., 1940.
	In.		In.	In.
South Coast—contd.				
Gatton College	1·08	42	0·23	0·21
Gayndah	1·16	70	0·12	0·06
Gympie	1·69	71	0·28	0·76
Kilkivan	1·39	60	0·20	0·25
Maryborough	1·65	70	0·57	1·24
Nambour	1·92	45	0·62	3·35
Nanango	1·30	59	0·60	0·41
Rockhampton	0·84	70	0·01	2·17
Woodford	1·64	54	0.40	1·35
Central Highlands.				
Clermont	0·72	70	Nil	2·92
Gindie	0·65	42	..	1·40
Springsure	1·02	72	Nil	1·62
Darling Downs.				
Dalby	1·17	71	0·03	0·04
Emu Vale	1·09	45	0·30	0·28
Hermitage	1·12	36	..	Nil
Jimbour	1·12	62	Nil	Nil
Miles	1·11	56	0·09	Nil
Stanthorpe	1·76	68	0·48	0·17
Toowoomba	1·61	69	0·27	0·43
Warwick	1·43	76	0·18	0·07
Maranoa.				
Bungeworgoral	0·68	27	..	0·08
Roma	0·88	67	0·03	0·09

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1941.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure, Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	..	76	61	79	26	51	16	213	8
Herberton	..	69	44	77	20, 22, 23	28	14	118	6
Rockhampton	30·18	76	49	81	20	39	14, 15	1	1
Brisbane	30·19	71	48	75	19	40	9	75	3
Darling Downs.									
Dalby	..	69	37	76	21, 22	25	7	3	1
Stanthorpe	..	60	31	68	22	17	14	48	4
Toowoomba	..	63	42	69	22	30	14	27	3
Mid-Interior.									
Georgetown	30·10	82	49	88	22	35	15	Nil	..
Longreach	30·20	77	41	86	21, 22	31	8	Nil	..
Mitchell	30·22	69	33	79	22	21	14	22	1
Western.									
Burketown	..	82	54	88	20	45	14, 15	Nil	..
Boulia	30·18	77	45	89	21	37	15	Nil	..
Thargomindah	30·20	71	40	80	31	31	14	1	1

ASTRONOMICAL DATA FOR QUEENSLAND

NOVEMBER, 1941.

By A. K. CHAPMAN, F.R.A.S.

SUN AND MOON.

AT WARWICK.

Nov.	SUN. Rises.	SUN. Sets.	MOON. Rises.	MOON. Sets.
	a.m.	p.m.	p.m.	a.m.
1	5.1	6.11	3.43	3.18
2	5.0	6.11	4.35	3.53
3	5.0	6.12	5.27	4.29
4	5.0	6.13	6.19	5.6
5	4.59	6.13	7.10	5.43
6	4.58	6.14	8.0	6.24
7	4.57	6.15	8.50	7.7
8	4.56	6.15	9.39	7.52
9	4.55	6.16	10.26	8.39
10	4.55	6.17	11.11	9.30
11	4.55	6.18	11.54	10.23
12	4.54	6.19	nil	11.17
			a.m.	p.m.
13	4.54	6.19	12.36	12.14
14	4.53	6.20	1.17	1.12
15	4.52	6.21	1.58	2.13
16	4.52	6.22	2.39	3.16
17	4.52	6.22	3.23	4.21
18	4.52	6.23	4.10	5.28
19	4.51	6.24	5.1	6.36
20	4.51	6.25	5.55	7.42
21	4.51	6.26	6.54	8.46
22	4.51	6.27	7.54	9.44
23	4.50	6.27	8.56	10.36
24	4.49	6.28	9.57	11.23
25	4.49	6.29	10.56	nil
				a.m.
26	4.49	6.30	11.52	12.5
			p.m.	
27	4.49	6.31	12.46	12.44
28	4.49	6.31	1.40	1.20
29	4.48	6.32	2.32	1.55
30	4.48	6.32	3.23	2.31

Phases of the Moon.

4th November, Full Moon, 12 noon
12th „ Last Quarter, 2.53 p.m.
19th „ New Moon, 8.4 a.m.
26th „ First Quarter, 3.52 a.m.

THE EVENING STAR.

A GOOD deal of interest is now being taken in Venus, the Evening Star, or Hesperus, as it is sometimes called. We shall have to wait, however, until after full moon to see the stars at their best. Venus, the earth's twin-sister planet, now appears bright and high in the western sky at dusk; indeed, it will reach its highest altitude above the western horizon at sunset on 23rd November, when it will be 47 degrees east of the sun. In a telescope Venus appears half-moon shape, but it is beginning to move into a position between us and the sun and, therefore, its shape gradually becomes crescented as its night side is slowly presented toward the earth. After it has reached its greatest altitude, its size and brillancy will appear to grow for another month or so as it approaches the earth. After that, the bright crescent will become too slender to give as much light and, ultimately, the crescent Venus will entirely disappear as the planet passes between us and the sun. It is not because of the planet's great size that it appears the brightest of stars, but because of its nearness and the sunlight which is reflected from its mantle of cloud.

VENUS COMING NEARER.

Venus is at present nearly 77,600,000 miles away, but it is coming nearer and will be nearer than either of the other worlds ever come early in the new year. However, we shall not then see it as it will be between us and the sun.

Mars was at its nearest last month. The earth is now passing on and leaving the Red Planet behind. Mars will gradually lose its prominent place among the host of heaven and subside to the size of an ordinary star. It will be nearly twenty-six months before we shall see Mars as bright as it was last month. However, for some time its ruddy gleam will attract attention as it reaches the meridian earlier and earlier in the evenings.

About 7.30 p.m. the Pleiades rise, and a little south of them the planet Saturn shines with its yellow light, strongly contrasting with red Mars. Saturn will be at its best this month, as it will be in opposition to the sun on 17th November. At that date it will be at its nearest to us, if 756,000,000 miles can be called near. However, many great telescopes will point Saturnward to see what changes have taken place since last opposition. As the planet is always enshrouded in dense clouds, no surface markings can be seen; but large spots sometimes appear, which seem to indicate activity. Besides the great ring system, which has a spread of 171,000 miles, Saturn has a family of ten moons.

A world still farther away than Saturn is Uranus. This planet will also be in opposition this month—on the 21st.

COULD SWALLOW SIXTY EARTHS.

Uranus is one of the giant planets. Though smaller than Saturn, it is 30,900 miles in diameter and could swallow nearly sixty earths without appearing any larger. Its distance, at its nearest approach to the earth, will be 1,719,000,000 miles. Is it any wonder that this world, although 30,900 miles in diameter, cannot be seen by the naked eye? Although, it may be just possible to glimpse it for a week or two while at its nearest, if one knows exactly where to find it among the multitude of small stars in its neighbourhood. Uranus, at the beginning of November, is just a little east of Saturn and almost as far south as the width of Orion's belt.

About two hours after Saturn rises the greatest of the planets, Jupiter, comes up over the horizon. Jupiter rises with Orion, it being the bright "star" north of the giant Hunter; Jupiter is approaching the earth and is now showing at its best. It only requires a small telescope to see four of its eleven moons, which look down upon its great cloud-girt globe. These moons are interesting as they are in motion, even in a few hours their positions are seen to change.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

LOOKING SOUTH ABOUT DARK.

Now that summer is with us there is more water vapour in the atmosphere and, therefore, even on clear nights the stars do not shine as clearly as they do in winter. However, our summer skies are far more resplendent with brilliant stars than at any time of the year. Looking toward the south we see the same stars through the year, for all those within about 28 degrees of the South Celestial Pole, marked by a small cross in the picture, never set at Warwick but continue circling the pole year after year. Therefore, the bright star at the foot of the Southern Cross never sets, but just skims the southern horizon at Warwick. Although there is no bright star to mark the South Celestial Pole, its position is easily found. The Southern Cross, with its two bright "Pointers," is seen low in the Milky Way. From the Pointer nearest the Cross, draw a line upward toward the east until the bright star Achernar is reached. Half-way along that line is the position of the South Pole, around which all the southern stars appear to revolve every twenty-four hours and also once every year. Those who have followed these star pictures will have noticed how the Southern Cross circles the pole; six months ago it was on the opposite side of the cross which marks the pole. Soon, the Cross will set and its well-known figure will be missing from our evening skies until the circling year brings it up again in the south-south-east, where a bright star is shown above the mountains. This star is Canopus, the chief star of the Ship, Argo. In common with the other stars, it is circling the pole clockwise; therefore, Canopus will be seen for almost a year, until it sinks to the south-south-west horizon, where the Cross now appears. Canopus must be a sun of tremendous size and brilliancy. It is the second brightest star in the heavens. Sirius is the brightest, but Sirius is but 9 light years away, while Canopus is probably about 652 light years away. As it appears so bright at so great a distance it must be tremendously large. It is whiter and hotter than our sun, its surface temperature being about 13,000 degrees Fahr. while the sun is but 10,000 degrees. Returning to the Cross and its Pointers, which are Alpha and Beta Centauri, it is interesting to note that Alpha, the star farthest from the Cross, is the nearest bright star to the earth, its distance being only 4¼ light years—26 millions of millions of miles!

Near Alpha Centauri is a well-shaped triangle of stars, which is known as the Southern Triangle. A much larger triangle, and a more useful one, is made up of three bright stars in the upper half of the picture. The star at the top is Fomalhaut, in the Southern Fish. The base of the triangle is marked by Achernar, which is on the opposite side of the pole from the Southern Cross, and Alpha Pavonis, the chief star in Pavo, the Peacock, the tail of which is marked by three faint stars in a row, a little below. When this great triangle is once found it becomes a prominent sky sign. In its west side is Grus, the flying Crane; at this time of the year it is flying upward. The two bright stars mark the upraised wings, a long line of small stars, some of them naked eye doubles, form the outstretched neck, while a brighter one forms the head. On the other side of the wings a few small stars form the tail. The two wing stars point across to the other side of the triangle, where is the faint constellation of the Phoenix, and in the base of the triangle are some small stars of Toucan, a South American bird. Below the base of the great triangle are the two clouds of Magellon, appearing like patches of the Milky Way.*

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling, members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including post

Vol. LVI. 1 NOVEMBER, 1941 Part 5

Event and Comment

National Nutrition.

BETTER Nutrition—that is food, good food and plenty of it—does not mean soft living. It does not mean growing fat and lazy; and it does not mean concentrating our interest, or attention, on the flesh pots, the luxuries of life. On the contrary, better nutrition means becoming harder in physical condition, more efficient, and better able to work overtime when necessary, and finding it easier to do without luxuries when we have to.

In these days we do not know exactly what is ahead for us or the world, but we do know that we are going to be called on to make sacrifices. That is all the more reason for giving attention to the whole problem of nutrition now. By applying our brains, our knowledge, and our common sense to the use of our vast resources, we can be a well-nourished and efficient people, in spite of any sacrifices we may have to make.

Farmers have already learnt that when any large proportion of the population is on a poor diet, the market for farm products drops accordingly. Farmers can fare well only if the nation can eat well. That is a basic and simple truth which we all understand.

We are fortunate in that we have gone a fair distance towards stabilising agriculture in our own country, especially in respect of foodstuffs of high nutritive value, and that progressive policy is sticking to us in these days of national emergency. We are learning to control

acreage, store and hold surpluses, shift to other crops where possible, and divert products to other than the usual outlets. The alternative for farmers is a mad scramble of over production and soil exploitation in a desperate and vain effort to make ends meet at unpayable prices.

The big job, and a very difficult job, too, which we are now facing is to adjust primary production on a national scale. Once we are able to do this through sufficiently wide-spread co-operation and adequate administration, adjustments can be made according to the needs of any given situation. This would mean that a constant supply of food and feed could be turned at any time into the channels of consumption to meet any emergency.

As a matter of fact, in a comparatively small way an adjustment is already being made in our change-over from butter to cheese manufacture. In this respect, the dairy industry is fortunate that, unlike some of our other exporting industries, it has an alternative product. By changing over from butter to cheese we are meeting an abnormal export marketing situation, and are producing an easily transportable food of the highest nutritive value, and are so helping to maintain the health of the whole nation.

And to get back to the general question of nutrition, dietitians tell us that in cheese we have a complete food in a more or less concentrated form, and cheese is an excellent substitute for meat.

Whether it be for our children, our workers in every field of industry, or our fighting forces, the first essential is an abundant supply of the *right kind* of food. On a foundation of good food we can build almost anything. Without it we can build nothing.

The Conversion of Feeding Stuffs to Food for Man.

IT is the aim of many farmers to make their grain walk off the farm in the shape of cattle, pigs, and poultry, and, in suitable circumstances, it's a good idea. In the Old Country, the nutritional experts have been very busy getting together a lot of information from a large number of experiments and a great variety of sources, and they have compared the relative efficiencies of animals in producing protein, fat, and energy. To do this, different periods in the life of the animals were chosen.

The efficiency of fattening the mature bullock or pig can best be compared with that of a cow in full milk; while the efficiency of the bullock from birth to slaughter is, for baby beef, to be compared more with a complete year in the life of the cow, and, for the two to three-year-old bullock, with the whole life of the cow. The feed expenditure put down for pork and bacon pigs covers only the period from weaning to slaughter, but actually the expense of rearing from birth to weaning would make only an insignificant reduction in efficiency. The efficiency of egg production is on the same basis of comparison with that of milk production.

Taking all these points into consideration, the investigators conclude that the cow producing 6 gallons of milk every day is more efficient, in all respects, than any of the other animals. Even at the productive level of 4 gallons a day, the cow is superior—except in fat production, in which she is beaten by the pig. The hen laying an egg every day competes with the cow—relatively, of course—or equals the cow in protein production.

Over a year, the average 600-gallon cow is beaten in fat production by the pig, but only good hens, laying as many as 200 eggs in the year, equal the cow in protein production.

For meat production, the pig is more efficient in all respects than beef cattle. Poultry produce meat protein more efficiently than either cattle or pigs, but produce fat much less economically.

This aspect is receiving considerable attention in Britain to-day, where the aim is to allocate animal feeding stuffs to the classes of livestock that can do most to meet the needs of the people over there.

Out of this war are coming many new ideas, and we are certainly reducing the science of feeding both man and beast to a fine art. And this remarkable fact has emerged from two years of war rationing in the Old Country. The health of the people in the Homeland has, on the whole, improved greatly as compared with the pre-war standard. That fact would seem to strengthen the belief that many of us eat far too much and, for some of us at least, the best physical exercise is pulling the chair away from the table.

Transport of Milk from Shed to Roadside.

WITH the change-over on many farms from the supply of cream to butter factories to the supply of milk to cheese factories, quite a few problems have cropped up with dairy farmers. And not the least of these difficulties is the job of getting the much bulkier milk—one can of cream equals ten cans of milk—from the dairy to the roadside, where a pick-up milk transport service has been arranged. Cartage thus becomes a big undertaking, seeing that it has to be done every day, even where there is a good track from the shed to the roadside. And a dirt road in wet weather—well, we all know what that means. The construction of a permanent all-weather drive cannot be done cheaply, either. Some New Zealand farmers in districts where wet winter and spring conditions cause water-logging of their land have got over the difficulty by building a trolley to run on lines between the dairy and the roadside. Apart from a set of flanged wheels and axles, the only materials needed in its construction are timber, nails, and bolts. The trolley line is made of 3 x 2 hardwood rails, laid on rough round-backed sleepers spaced 4 feet apart. The rails are placed on edge to give a 3-inch depth, and are held in position with 6-inch spikes driven right through into the sleepers. The track for such a trolley line should, of course, be rough-levelled, and the rails spaced about 3 feet 3 inches apart, or, in other words, on 3 feet 3 inch gauge. To make the trolley rails last long, each length could be treated with creosote, although that may not be essential.

Trolleys can be built in various sizes to meet individual requirements, but should be high enough to avoid a big lift of the milk cans from the deck of the trolley on to the milk-collecting lorry. It is not easy to juggle a full milk can weighing, say, up to a couple of hundred pounds, and when many cans have to be handled the work can become very exhausting. The trolleys used for this purpose are usually about 3 feet 6 inches high. The four flanged wheels are about 15 inches in diameter and coupled by 2-inch axles. Length and width can be varied to suit individual requirements. Where a trolley line has to be taken across wide, open drains heavy stringers or girders—hardwood logs, say, squared on top to take the rails—are needed to support the trolley line.

Such a milk trolley and track are certainly worth thinking about, especially in black-soil country likely to become boggy in wet weather.

Notes on the Papaw and its Improvement in Queensland.

G. W. J. AGNEW, Q.D.A., Q.D.D., Nambour Research Station.

THE value of the papaw has gradually become recognised since its introduction to Queensland as an exotic tropical fruit in the early days of settlement, and it now plays a significant and not unimportant role in the fruit industry of the State. (Plate 112.)

Much information on papaws has been accumulated in countries where this crop has been the subject of investigation at various times over the past half century or so, notably in the Hawaiian Islands, the Philippine Islands, and more recently in the Union of South Africa. During the last three years horticultural research in Queensland has expanded considerably, and the study of the papaw as a crop plant has formed part of that expanded programme.

The results of recent work both in Queensland and overseas should give considerable encouragement to those interested in the culture of this plant. Indeed there is good reason to believe that the status of the papaw as a commercial fruit can be considerably improved; but, if this is to be accomplished, it is necessary from the outset for growers to obtain a correct picture of the present position, and to realise that the only methods by which the desired results can be achieved are those based on sound botanical knowledge and principles.

THE NEED FOR FRUIT IMPROVEMENT.

The great majority of marketed papaws present an almost unclassifiable bulk when compared with the standards set by other fruits. In general, there is considerable variation in flavour, colour, size, shape, and in fact in most of the principal features which govern the quality of the fruit. Many of the variations in fruit characters are unattractive, thus giving rise to fruits of inferior quality. With most other commercial fruits, standardisation is made possible by the production of fixed varieties, but no true horticultural varieties of the papaw are grown in Queensland comparable for instance with those of the apple, grape, or orange, which are vegetatively propagated and thus provide fruit with a high degree of varietal uniformity and distinctiveness. There are, however, very promising individual papaw trees which, from lack of a suitable means of perpetuation, lose their value as potential parents of superior varieties. A most immediate need, therefore, is the production of fixed uniform papaw varieties of superior type, in order to obtain standardisation combined with high quality.

The distinctive features which render it possible to differentiate between superior and inferior papaw fruit types, are the result of intrinsic differences in the characters of individual plants, and must not be confused with the minor transient variations in fruit quality, such as the impairment of flavour in winter-maturing fruits grown towards the lower limits of the sub-tropics, and which are the result of environmental influences.

In general, papaws are naturally adapted to cross-fertilisation and this has enabled interbreeding to take place between numerous widely

divergent strains. Thus the increase in the number of trees since the earliest introductions were made, has been accompanied by a comparable increase in the number of types. An examination of almost any papaw plantation discloses great dissimilarity in fruit types, and indeed it is often difficult to find several trees which closely resemble one another.

Papaws are commonly propagated by seed obtained from individual fruits chosen in packing sheds and farm kitchens, or from seed collected in bulk from canning factory refuse. The multiplicity of fruit types present in plantations is therefore not surprising, because little or no cognisance is taken of the nature of the seeds, and their all important influence on the characters of the plants which are produced from them. If control is to be exercised over material propagated with the object of producing fruits of superior type, it is essential that papaw growers become seed conscious, and that they possess a working knowledge of papaw flowers and their relation to fruit production, their function in the plant reproductive process, and their influence on breeding behaviour. Papaw flower and plant types are accordingly discusssed in the following paragraphs.

FLOWER AND PLANT TYPES AND THEIR RELATION TO FRUIT PRODUCTION.

A great deal of misunderstanding exists with regard to the occurrence and function of papaw flowers. This is attributable to the complexity of flower and plant types.

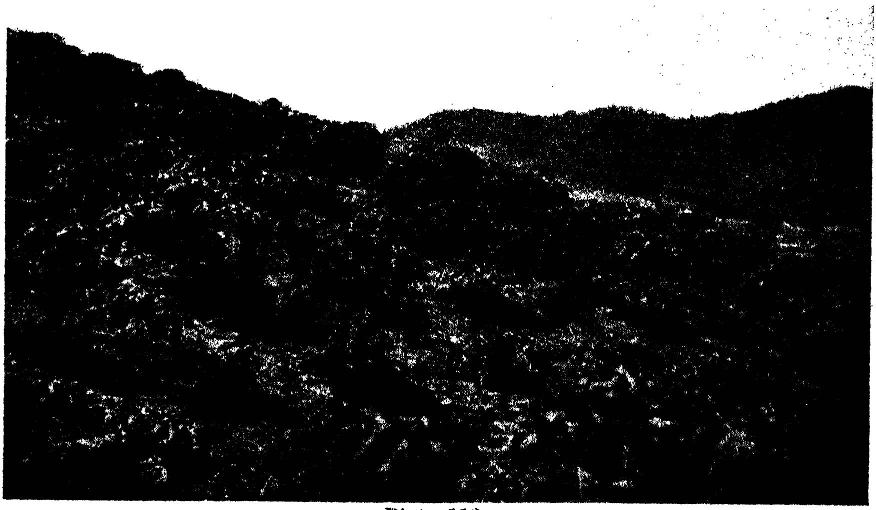


Plate 112.

TYPICAL QUEENSLAND HILLSIDE PAPAW PLANTATION.

Flower Types.

Most species of flowering plants bear hermaphrodite flowers, with the reproductive organs of both sexes in combination, that is, both pistil and stamens occur within the same flower. There are, however,

three primary flower types (Plate 113) in the papaws, namely pistillate, staminate, and hermaphrodite or bisexual, and individual trees may bear one, two, or very rarely all three of these. Generally where more than one flower type occurs in a single plant, their co-existence is for brief periods only.

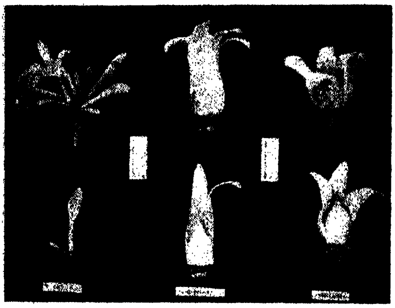
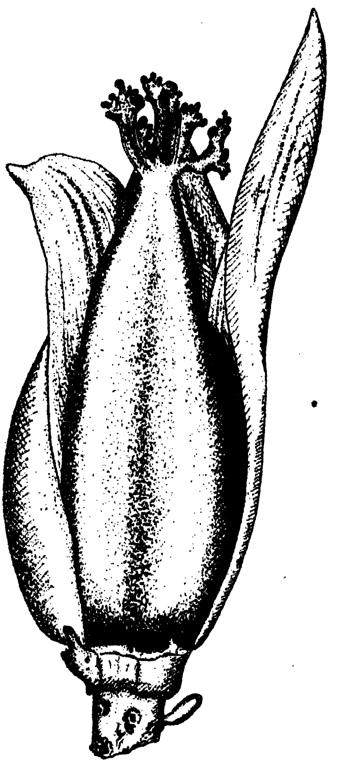


Plate 113.
PRIMARY PAPAW FLOWER TYPES.

Pistillate flowers (Plate 114) are those which express the characters of femaleness only. They have five petals, free for their entire length, surrounding the female reproductive organ, the pistil, which is the flask-shaped structure protruding outwards from the centre of the flower. The upper portion of the pistil, the stigma, opens its five crinkled lobes at full bloom as receptive surfaces for pollen. The lower bulbous part of the pistil is the ovary, which is hollowed to form a cavity attached to the lining of which are the ovules, or seeds-to-be (Plate 115).



[*Drawing by W. W. Manley.*
Plate 114.
PISTILLATE PAPAW FLOWER.

Flowers in which maleness only is expressed are staminate (Plate 117). The comparatively small petals of these flowers are fused together for slightly over half their length, forming a slender tube, which bears the stamens or male reproductive organs. There are ten stamens, each of which has a yellow lobed anther at its apex. The anthers produce pollen which is liberated in the late bud stage, just prior to the opening of the flower. Staminate flowers cannot produce fruit, since the pistil which takes the form of a fine thread with a bulb at the base is rudimentary and functionless.

Hermaphrodite flowers of the papaw are classified into three types, pentandria, intermediate, and elongata, according to the nature of their structural modifications. The importance of the various flower structures lies in the effect which they produce on fruit type. The pentandria type (Plate 118) is somewhat similar in general features to the pistillate type, except that it has five large stamens which arise near the base of the petals, and lie along grooves on the outer surface of the ovary. Pentandria flowers produce a typically squat fruit with deep grooves and well defined petal scars at the base of the fruit. The intermediate type (Plate 119) comprises an indefinite group of freakish and distorted

Plate 115.

CROSS SECTION OF THE OVARY OF A PISTILLATE PAPAW FLOWER SHOWING OVULES.

Plate 116.

FEMALE PAPAW TREE IN BEARING, SHOWING FRUIT PRODUCED BY PISTILLATE FLOWERS.

flowers, exhibiting various degrees of sexual development; malformed stamens and pistil are present in many grotesque associations. Fruits produced by intermediate flowers are extremely irregular in structure, and usually are of no commercial value.

The elongata (Plate 120) is the commonest hermaphrodite flower type. It has an elongate pistil partly enveloped by the petals which are united for portion of their length, thus forming a collar around the ovary. There are ten stamens attached to the throat of the petal tube. Elongata flowers give rise to long fruits resembling in this respect a cucumber or they may be pear shaped. The seed cavity is comparatively small and often takes the form of a number of deep fissures, from which seeds are difficult to extract.

Dioecious Papaw Plants.

Plants normally bearing either pistillate or staminate flowers only are collectively referred to as dioecious. Colloquially, trees bearing pistillate flowers are termed "females," whilst those which normally bear staminate flowers only are referred to as "males."

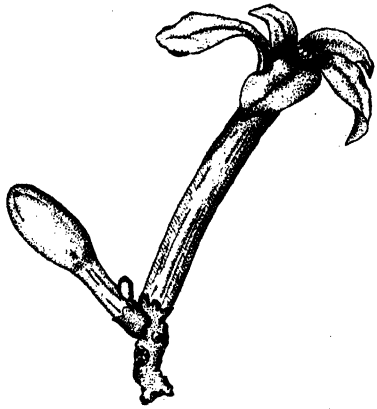


Plate 117.
STAMINATE PAPAW FLOWER.

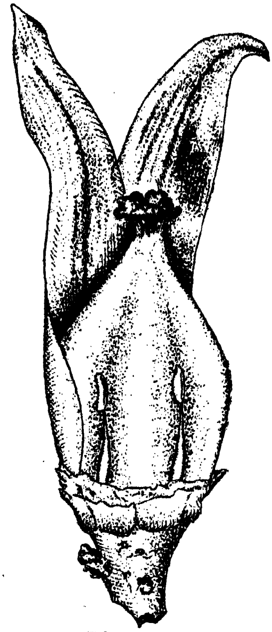


Plate 118.
PENTANDRIA TYPE OF HERMAPHRODITE PAPAW FLOWER.

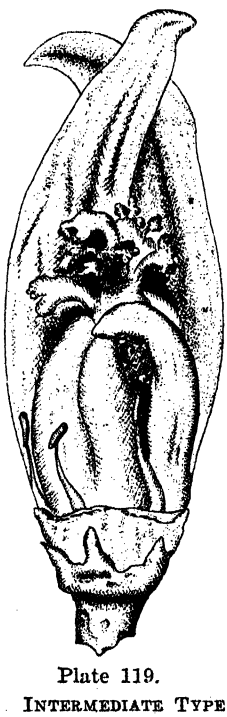


Plate 119.
INTERMEDIATE TYPE OF HERMAPHRODITE PAPAW FLOWER.

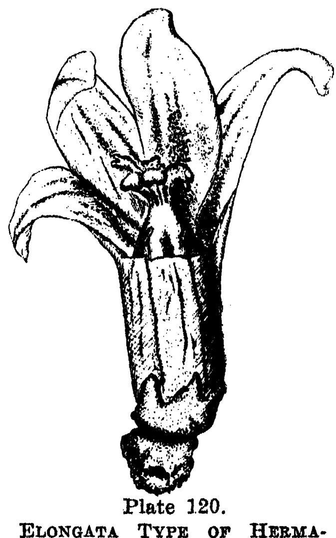


Plate 120.
ELONGATA TYPE OF HERMAPHRODITE PAPAW FLOWER.

[*Drawings by W. W. Manley.*

Plate 121.
FEMALE FRUITS SHOWING VARIABILITY IN TYPE DUE TO STRAIN DIFFERENCES.

The flowers of female trees are produced on single or but simply branched stalks varying from one to several inches in length, according to the characteristics of the strain. A principal flower is borne at the apex of the flower stalk, and smaller subsidiary flowers appear on the flower stalk further back towards the leaf axil. The size and number of subsidiary flowers varies considerably on the one tree during the flowering season as well as between trees of dissimilar strain.

Fruits produced by the pistillate flowers of female trees are usually rounded or oval in general outline (Plates 116 and 121), whilst common

Plate 122.
MALE PAPAW TREE IN BEARING, SHOWING FRUIT PRODUCED BY SEASONALLY OCCURRING REDUCED HERMAPHRODITE FLOWERS.

irregularities occur in the form of beaked fruits or fruits which taper away at the stalk end.

The staminate flowers of male trees are produced in large numbers on profusely branched stalks, which attain a length of from three to five feet. Some male trees bear a number of reduced hermaphrodite flowers at the terminals of these stalks, particularly during the cool spring and autumn months. The pistils of these flowers become sufficiently developed to enable them to produce fruit (Plate 122) and large crops may be produced in this way, though the fruits are extremely variable in quality and are often of inferior type (Plate 123).

Plate 123.
PAPAW FRUIT TYPES PRODUCED BY HERMAPHRODITE FLOWERS ON MALE TREES.

Hermaphrodite Papaw Plants.

All three hermaphrodite flower types are produced on flower stalks in a similar fashion to that of pistillate flowers on female trees. In the case of hermaphrodite flowers, however, the subsidiary flowers are in many instances functional staminate ones or abnormal hermaphrodites. In some cases, and particularly during the cool months, staminate flowers may be almost exclusively produced, and the trees then become virtually functional males for a limited period.

Plate 124.
HERMAPHRODITE PAPAW TREE IN WHICH THE PENTANDRIA FLOWER TYPE PREDOMINATED.

Plate 125.
HERMAPHRODITE PAPAW TREE IN WHICH ELONGATA FLOWER TYPE PREDOMINATED.

The three types frequently occur in the same tree, generally with pentandria (Plate 124) and elongata (Plate 125) predominating from time to time during the flowering season. In other trees again, one of the three types, commonly elongata, predominates throughout the life of the plant.

In Queensland, trees which bear practically all elongata flowers and which characteristically produce long narrow fruit, are popularly called "Long Toms." At one time this term may have signified one distinct strain, but at present it is applied indiscriminately to any long-fruited strain, and the use of the term Long Tom as representing a horticultural variety is now misleading.

Fruit produced by pentandria, intermediate and elongata hermaphrodite flowers are illustrated in Plates 126, 127, and 128.

POLLINATION AND FERTILIZATION.

Plate 126.
PAPAW FRUIT TYPES PRODUCED BY PENTANDRIA, INTERMEDIATE, AND ELONGATA HERMAPHRODITE FLOWERS.

Plate 127.
ELONGATA HERMAPHRODITE PAPAW FRUITS SHOWING VARIABILITY IN TYPE DUE TO STRAIN DIFFERENCES.

Pollination is the act of placing pollen on the surface of the stigma of the female reproductive organ. In order to pollinate pistillate flowers of a female tree, pollen must be transferred from the staminate flowers of a male tree, or from flowers of hermaphrodite trees. Hermaphrodite trees, on the other hand, may be self pollinated, though cross pollination with males and other hermaphrodites can and does occur.

The very small pollen grains of the papaw are shed in large numbers and their transference to the surface of the stigma takes place principally by wind action. Flower-visiting insects have not been observed to act as important agents in distributing papaw pollen. In certain districts, however, bees are occasionally seen gathering pollen from the flowers of male trees, but the pistillate flowers of female trees do not appear to be particularly attractive to them, though in a few instances bees have been recorded working in these flowers also.

Pollen grains are living plant tissue, and when placed in a suitable medium such as that present on the surface of the stigma, each grain develops a pollen tube which grows down through the pistil. The specialised male sex cell carried in the pollen tube, eventually unites with the female sex cell in one of the ovules within the ovary. Fertilisation of the ovule has thus been accomplished, and the product of the union of male and female sex cells becomes the foundation for the development of the seed.

A well-seeded papaw fruit may contain a thousand seeds or more, and every seed in the fruit represents a fertilised ovule in what was

originally the ovary of the flower. Remembering the possibilities of chance pollination by wind, it is apparent that in a field of mixed types, any one flower may receive pollen from numerous sources, and as a result, seeds of the same fruit may have a mixed male parentage.

Plate 128

FRUITS OF A HERMAPHRODITE PAPAW TREE IN THE EARLY STAGES OF DEVELOPMENT.—The lower fruits have been produced by elongata flowers, and the centrally placed malformed fruits by intermediate flowers. Flowers in the top centre are Pentandria hermaphrodites.

IMPROVEMENT BY SELECTION.

Whilst certain cultural practices may tend to improve the crop being treated by helping to bring out the characters of the plant, such treatment cannot change an inherently bad papaw into a good one.

Every papaw plant carries with it hereditary substances, supplied by both male and female parents, which govern its reactions from the initial one-celled stage on to maturity. Thus any real improvement in the characters of the plant concerns its germinal or hereditary constitution, and since heritable characters are determined by the interaction of numbers of inherent or genetical factors, it follows that progressive selection must result in bringing about a greater summation of the factors which make for improvement, thereby raising the standard towards the ideal.

In the past, some growers with isolated dioecious plantings have achieved a certain degree of improvement by mass selection methods, consisting of the eradication of off-type females and weak males followed by the maintainence of a continuity of seed supply from the best female trees only. Unfortunately much of the value of these attempts has been lost as a result of the subsequent introduction of

inferior types, particularly when the introductions have been of hermaphrodite strains.

ESTABLISHING PURE LINES.

With dioecious papaws, male and female parental lines are selected and purified by brother x sister matings and the culling of off-type individuals for several generations in order to obtain pure breeding varieties. Work done in the United States of America and in the Union of South Africa (United States Department of Agriculture, 1937, and Hofmeyr, 1938) has shown that the desired horticultural characters can be fixed and maintained by selection in this manner.

A programme to establish pure lines from locally selected and introduced strains is already in progress in Queensland, but as with any similar programme, several years must elapse before selected material has been purified and tested.

The establishment of fixed hermaphrodite varieties is a subject undergoing investigation. At present it appears that it is not possible to obtain true breeding hermaphrodite strains owing to the unstable nature of their complicated sexual constitution, as will be seen from the results obtained in the study of sex inheritance.

INHERITANCE OF SEX IN THE PAPAW.

Queensland papaw plantations vary considerably in their distribution of sex types. There are wholly dioecious plantings and others with a majority of hermaphrodites but, in the main, plantations consist chiefly of dioecious plants interspersed with a few hermaphrodites. Growers must therefore be familiar with some of the facts concerning the distribution of sex in the progenies of the different possible matings among the common sex types.

The study of sex inheritance in the papaw is at present undergoing investigation by geneticists. Though it is not within the province of this paper to deal with this subject, the following information presented by Hofmeyr (1938) and Storey (1938) from independent investigations is of interest and importance.

Parentage.	Progeny Ratios.
Female x male.	Females and males 1 : 1.
Female x elongata hermaphrodite.	Females and hermaphrodites 1 : 1.
Elongata hermaphrodite x male.	Females, males, and hermaphrodites 1 : 1 : 1.
Elongata hermaphrodite self fertilized.	Females and hermaphrodites 1 : 2 (Hofmeyr). Females, hermaphrodites, and males 1 : 2 : .05 (Storey).

An important point which can be discerned from this segregation table is that of the elimination of male trees from the progenies of the matings, female x elongata hermaphrodite, and their virtual if not actual elimination from self-fertilized elongata hermaphrodites. Thus by breeding in this manner a reduction in the number of non-bearing trees is brought about, thereby saving time in planting operations and increasing the total yield of a plantation. It is assumed that hermaphrodite trees can adequately displace male trees as pollinators. Whilst this is possible, sufficient evidence has yet to be obtained to show that this is so under the conditions prevailing in South and Central Queensland coastal areas.

POINTS IN THE SELECTION OF THE FEMALE PARENT.

The following points indicate the most important features to be aimed at in the selection of the female parent:—

(1) Vigorous growth as indicated by robust development is an essential characteristic.

(2) A short though stout trunk with low fruiting habit is desirable. Low fruiting avoids many harvesting difficulties, particularly with the second and subsequent crops. It may be noted that a reasonably low set of fruit can be attained with many of the common papaw types by planting the seed in early January and transplanting to the field in late March or April.

(3) Fruit spacing on the trunk should be free, preferably with one fruit to each leaf axil. If subsidiary fruit development be too prolific, crowding results and this can be obviated only by continuously thinning out during the flowering season.

(4) Smooth-surfaced and oval-shaped fruits, weighing from 3 to 4 lb., are the most readily saleable either as fresh fruit or for canning in all marketing centres.

(5) Fruit skin colour is an important consideration. This character is subject to much modification by environmental conditions and the value of good colour is often nullified by disease spots and blemishes. Richly-coloured types are considerably more attractive than those maturing with mottled skins, or those which on ripening show little change in colour from the immature green.

(6) Fruit flavour is probably the most variable character in the papaw and even on the one tree the flavour fluctuates from season to season. A sweet and distinctly pleasant flavour is required.

(7) A good papaw must have a firm flesh with average thickness of from 1 to 1½ inches, with a bright orange colour.

SELECTION OF THE MALE PARENT.

Owing to the fact that some male tree must be chosen and that any characters of fruit production it will be likely to confer on its progeny are unknown, it is necessary in the first instance to make several male parent selections.

An endeavour should be made to ascertain the past history of the proposed male stock in order to utilise, as far as possible, the qualities of superior strains. Vigorous males which flower prolifically should be chosen. These males can then be mated with the same chosen female and their progenies maintained separately to enable comparisons to be made and thus determine which are the most desirable parents.

CONTROLLED HAND POLLINATION WITH DIOECIOUS PAPAWS.

Following the selection of male and female parent plants, it is necessary to carry out the actual process of pollination under controlled conditions so as to obtain pedigreed seed. The operation of hand pollination for pedigreed seed production is one in which every care must be exercised to guard against contamination by foreign pollen.

The operation is carried out in the following manner. The flowers of the female tree are covered with paper bags a day or two prior to their opening; paper bags 4 inches by 2 inches, as used for certain

confectionary purposes, have been found to be suitable. All subsidiary flowers on the principal flower stalk are removed and the bag is slipped over the large apical bud, and clipped tightly onto the flower stalk with a paper clip or fastener, so as to prevent the ingress of foreign pollen. When the pistillate flower opens inside the bag pollen is dusted from flowers of the selected male tree on to the surface of the stigma, and the bag is again quickly placed in position to cover the flower. The transference of pollen is easily accomplished by removing the unopened petals from late stage staminate flower buds, and then using the remainder of the flower as a brush. Pollen is shed in the staminate flower just before the petals open, and it is therefore necessary to take the staminate flower at this stage.

The pollinated flower is appropriately labelled, the female and male parentage being recorded on the label. For this purpose small commercial tag labels, which have been dipped in hot paraffin wax after marking, are useful and are durable and of sufficient size for convenience in handling. The loop of the tag is slipped over the bagged flower and is held on the flower stalk.

Seven days following the operation of pollination, the bag can be removed, when it is obvious from the increase in size of the ovary and the brown discolouration of the stigma that fruit setting has occurred.

During the flowering season an average of about three flowers are produced each week on each plant, though these may not all be in a receptive condition at the same time. Each flower subjected to controlled hand pollination is the potential bearer of from 500 to 1,000 seeds at the maturity of the fruit. It is advisable to treat three to four times the number of flowers estimated to give sufficient seeds for minimum planting requirements, to allow for losses resulting from injuries to the fruit or poor seed germination.

Plate 129.

PAPAW TREE BEARING CROP OF WELL-FORMED, EVENLY-DEVELOPED FRUIT, INDICATING FAVOURABLE NATURAL POLLINATION.

FRUIT AND SEED SETTING.

Normally, effective fruit development depends upon successful fertilisation of the ovules, resulting in fully-formed and well-seeded fruits. (Plate 129.) In the central and south coastal districts, however, it is common to find trees bearing a number of undersized, seedless, and near-seedless fruits, particularly on female trees. These fruits may drop off in the early stages of development or they may be carried to maturity. All degrees of fruit size are encountered, from those almost fully developed to those about the size of a hen's egg. (Plate 130.) The weight and size of the fruit is roughly proportional to the number of seeds set, varying with the individuality of the tree, and with seasonal conditions at the time of flowering.

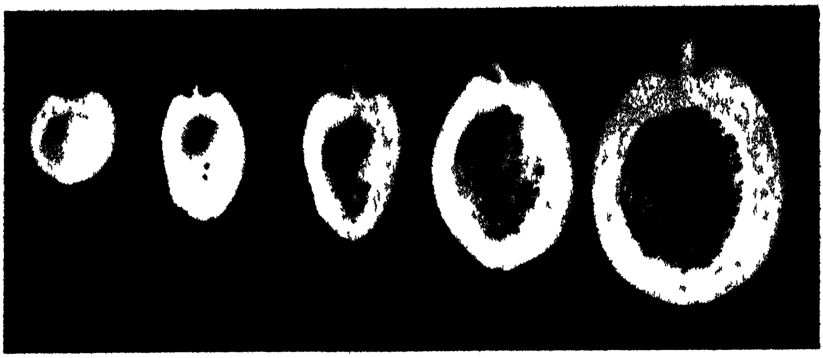


Plate 130.
PAPAW FRUITS SHOWING THE REDUCTION IN SIZE AND THE VARIATION IN SHAPE RESULTING FROM DEFECTIVE POLLINATION.

From their experience in the Madras Presidency of India, Cheema and Dani (1930) concluded that seedlessness in the papaw is due to lack of pollination. Recent investigations in Queensland have confirmed this conclusion, except that there are cases where seedlessness is a heritable characteristic. In describing the occurrence of seedless papaws in the Union of South Africa, Hofmeyr (1938) states that climate and deficiency of available pollen are probably the determining factors.

At times when pollen has been abundantly produced by male trees which have comprised as much as 10 per cent. of the tree population, examinations have shown that only a small proportion of the fruit developed with a full complement of seed, as the result of natural field pollination, whereas flowers hand pollinated at the same time produced well-seeded fruits.

Plate 131.
PAPAW TREE SHOWING THE REDUCTION IN THE NUMBER OF FRUIT RESULTING FROM DEFECTIVE POLLINATION.

At certain times of the year, flowers which have been covered to prevent pollination, have produced small seedless fruits parthenocarpically, that is without the stimulus of pollination and fertilization. When defective pollination thus occurs, trees which bear a large number of subsidiary flowers often produce a large crop of small seedless and near seedless misshapen and crowded fruits.

Observations in South Queensland during 1939, 1940, and 1941 showed that, with occasional exceptions, staminate flowers of male trees produced large quantities of pollen throughout the flowering season, which extends from October to July. There were, however, brief

periods when pollen was not produced, though there was an abundance of flowers. Two such periods were observed during the 1940-41 flowering season. These definite non-functional periods were of two to three weeks' duration, and during them pollen was absent in the mature anthers of staminate flowers; the presence of pre-pollen forms, or tetrads, in mature anthers confirmed the fact that pollen abortion had taken place.

Defective pollination is considered to be one of the chief cultural problems of dioecious papaws in the central and south coastal areas of Queensland, and it is therefore at present a subject of investigation. It is responsible for a considerable falling off in yields because of a reduction in the size and number of fruits (Plate 131), for irregularity in fruit shapes within the one tree and, in certain instances, for permitting prolific subsidiary fruit development, resulting in a crowded undersized crop. At the present time hand pollination appears to be the only suitable corrective available, but the limit of its practical application is exceeded in plantations of tall trees, where difficulties are encountered in handling flowers to be pollinated.

Occasionally trees are found which bear almost an entire crop of fully-developed fruits, which are seedless or which have only one or two seeds in some of the fruits. The ovules in these instances are shrivelled and shrunken even in the bud stage of the flower, which suggests embryo abortion. There is evidence to show that this condition of seedlessness is a heritable character. At Nambour seedlessness has reappeared in the progeny of a plant selected for this character.

ASEXUAL PROPAGATION AS A MEANS OF MAINTAINING SUPERIOR FRUIT TYPES.

Plate 132.

DECAPITATED PAPAW TREE SHOWING FORCED OFFSHOOTS WHICH ARE USED AS SCIONS.

The grafting of papaws has received attention in tropical and subtropical countries during the past half century, with the object of avoiding losses due to the culling of male trees, and as a possible means of perpetuating selected strains and retaining uniformity of type. A grafting technique was worked out by Fairchild and Simmonds (1913) in the Hawaiian Islands and by Wester (1916) in the Philippine Islands, and propagation by cuttings has also been accomplished.

Reports of previous research have indicated the impracticability of commercial asexual propagation with the papaw. Experience in Florida showed that grafted trees lost vigour and degenerated rapidly to worthless types. Pope (1930) stated that: "With present knowledge of the species it is useless to practice vegetative methods of propagation as both environmental and hereditary variations frequently occur."

A simple cleft or wedge graft is employed in grafting papaws in Queensland, and grafting is most successfully accomplished in the hot dry months. Eight to ten weeks old seedlings are used as stocks, and the scion wood is taken from offshoots of selected parent trees. (Plate 132.) Initial grafting studies in this State were chiefly concerned with technique, and there is a field of grafted trees in full crop in which investigations are now proceeding. In order to examine the nature of the apparent degeneracy and loss of vigour in grafted trees, the life histories of a number of clones will be studied over several asexual generations.

A number of difficulties are encountered in grafting papaws on a large scale. Scion wood is not abundantly produced even when forced by decapitating the female tree, and allowing the shoots to develop. Offshoots, which are to be used as scions, vary considerably in vigour because they arise from different parts of the parent stem, and this makes uniformity in nursery stock-scion sizes difficult to obtain.

Plate 133.
Grafted Papaw Tree in Flower.

Plate 134.
Grafted Papaw Tree in Full Bearing.

The economic life of the average papaw plantation extends over only three or four yearly crops. Such a short span of usefulness requires that propagation should be simply and easily carried out, and the attendant difficulties associated with grafting papaws for commercial planting are such that the economic value of asexual propagation is very doubtful. The method may, however, prove to be of more importance in the perpetuation of plants required for breeding purposes. (Plates 133 and 134.)

REFERENCES.

Boyd, A. J. (1917).—"The Papaw in Queensland." Dept. Agric., Queensland.

Cheema, G. S., and P. G. Dani. (1930).—"Papaya Cultivation in the Bombay Pres." Dept. Agric., Bombay, Bull. 162.

JOSHI, P. G., G. S. CHEEMA, and P. G. DANI. (1929).—"Seedlessness in Papayas." Agric. Journal of India, Vol. XXIV., Part III.

FAIRCHILD, D., and E. SIMMONDS. (1913).—"The Grafted Papaya as an Annual Fruit Tree." U.S. Bur. Plant Ind. Cir. 119.

HOFMEYR, J. D. J. (1938).—"Determination of Sex in Carica Papaya." Farming in South Africa, Vol. XIII.

HOFMEYR, J. D. J., and J. C. LE ROUX. (1939).—"The Culture of the Papaw." Farming in South Africa, Reprint No. 86.

HOFMEYR, J. D. J. (1938).—"Genetical Studies of Carica Papaya." Un. of S. Africa, Science Bull. 187.

JAYAWANT, M. L. (1925).—"Cultivation of Papaya." Trop. Agriculturist, Vol. LXIV.

MILES, L. G. (1936).—"Papaw Improvement." Report unpublished. Bur. Trop. Agric., South Johnstone, Queensland.

MORADA, E. K. (1929).—"Papaya Culture." Philippine Agric. Review, Vol. XXII.

POPE, W. T. (1930).—"Papaya Culture in Hawaii." U.S.D.A. Bull. 61.

STOREY, W. B. (1937).—Segregations of Sex Types in Solo Papaya and their Application to the Selection of Seed." Proc. Am. Soc. Hort. Sc., Vol. XXXV.

STOREY, W. B. (1937).—"The Primary Flower Types of Papaya, and the Fruit Types that Develop from Them." Proc. Am. Soc. Hort. Sc., Vol. XXXV.

TRAUB, H. P., and L. C. MARSHALL. (1936).—Rooting of Papaya Cuttings." Proc. Am. Soc. Hort. Sc, Vol. XXXIV.

WESTER, P. J. (1916).—"Plant Propagation in the Tropics." Philippine Bur. Agric., Bull. 32.

AGRIC. NEWS. BARBADOES. (1920).—"Cultivation of the Papaw." Vol. XIX., 7-8-20–21-8-20.

UNITED STATES DEPARTMENT OF AGRICULTURE YEAR BOOK. (1937).—"Improvement of Subtropical Fruit Crops." Separate No. 1589.

BUSHEL WEIGHTS.

For the information of farmers, the following list of bushel weights is given:—

	Lb. per bushel.		Lb. per bushel.
Barley	50*	Peas	60*
Beans	60*	Pollard	20*
Bran	20*	Prairie	20
Cowpeas	60*	Rape	56
Grass Seeds	20	Rhodes Grass	20
Lupins	60	Rye Corn	60*
Maize	56*	Rye Grasses	20
Mangel	20	Setaria	60
Meals	20	Sorghum	60
Millets	60	Soy Bean	60
Oats	40	Tares	60
Panicum	60	Vetches	60
Paspalum	20	Wheat	60*

* Indicates the legal standard as fixed by "*The Weights and Measures Act of 1924.*"

The ton is fixed at 2,240 lb. except for bran, pollard, and flour, which shall be 2,000 lb.

It should be noted that the Imperial bushel as used in Australia contains 2,218.2 cubic inches, whereas in the U.S.A. it is known as the Winchester bushel and contains 2,150.4 cubic inches.

Bean Fertilizer Investigations During 1941.

W. A. T. SUMMERVILLE, M.Sc., Senior Research Officer.

THE investigation of the fertilizer requirements of beans on the North Coast was carried forward a further stage during the 1941 season and, though the weather conditions were for the most part very adverse, much additional useful information was obtained and satisfactory progress can be claimed.

Field Experimental Work.

The main field experimental work consisted of tests of various levels of each of the three major fertilizers. From the report of the first series of experiments, which was published in this Journal in April, 1941, it was obvious that both nitrogen and phosphoric acid were required for the successful growth of beans, but that the addition of potash to any of the soils under investigation was apparently not followed by any great increase in the yield obtained.

After the establishment of the basic qualitative requirements of the plant in respect to the major fertilizers, the next step was to investigate the effects produced by known quantities of each. Accordingly this season two levels tests were conducted. These were located at Buderim and Cooroy, respectively, and the actual layout was essentially the same in each case. Sulphate of ammonia and superphosphate were each applied at three levels of 1 cwt., 2 cwt., and 3 cwt. per acre, whilst sulphate of potash was applied at the rate of ½ cwt. and 1 cwt. per acre and in one-third of the plots was omitted altogether. These levels were combined in every possible manner thus giving twenty-seven mixtures. In order that the method may be more clearly understood, the following examples of combinations employed are given:—

Combination.	Sulphate of Ammonia.		Superphosphate.		Sulphate of Potash.
No. 1	1 cwt.	+	1 cwt.	+	0 cwt.
No. 2	1 cwt.	+	1 cwt.	+	½ cwt.
No. 3	1 cwt.	+	1 cwt.	+	1 cwt.
No. 4	1 cwt.	+	2 cwt.	+	0 cwt.
No. 5	1 cwt.	+	2 cwt.	+	1 cwt.
No. 6	1 cwt.	+	2 cwt.	+	½ cwt.
No. 7	1 cwt.	+	3 cwt.	+	0 cwt.
No. 8	1 cwt.	+	3 cwt.	+	½ cwt.
			and so on up to		
No. 27	3 cwt.	+	3 cwt.	+	1 cwt.

The Cooroy plots were very badly washed by a sudden heavy fall of rain, and this was followed by strong westerly winds. The numbers of plants in the plots were consequently uneven and the run off of water along the rows made it rather risky to draw conclusions from these plots. On the other hand, very good results were obtained from the Buderim plots, and these were so clear cut that they can be accepted at their face value.

The accompanying graph (Plate 135) gives a very good summing up of the position as it was seen at Buderim. This may be elaborated as follows:—A level of 1 cwt. of sulphate of ammonia per acre appears to be the maximum required on this soil. Not only did further amounts

of sulphate of ammonia not increase the yield, but they actually led to a marked decrease. This decrease was, in fact, highly significant, and there is no doubt that this fertilizer in excess of 1 cwt. per acre is either just a waste of material or produces a still greater loss through an actual lowering of the amount of beans harvested.

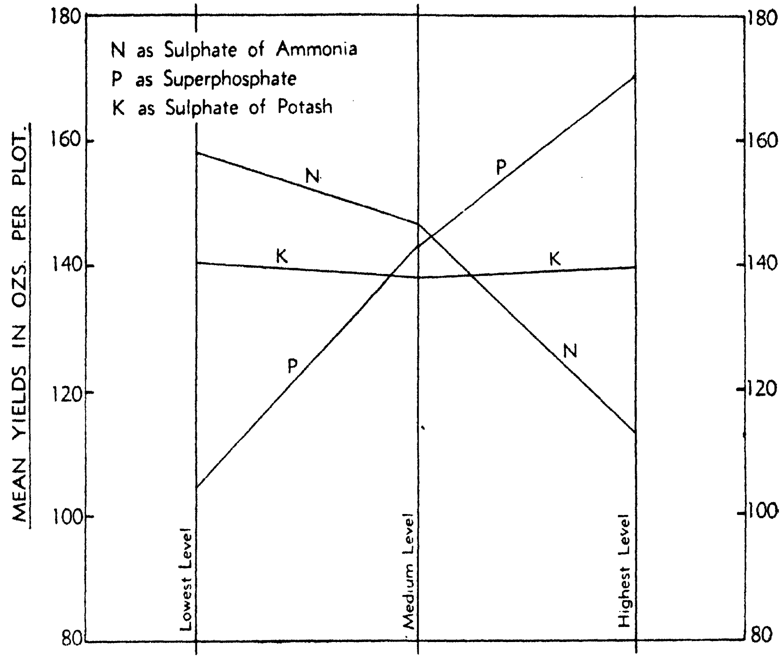


Plate 135.

On the other hand the yield of beans increased as the amount of superphosphate increased and very nearly in proportion thereto. That is to say the yield of beans from the 2-cwt. level of superphosphate was approximately half way between that at the 1-cwt. level and that at the 3-cwt. level. At the moment the maximum effective amount of superphosphate which can be employed has not been determined. Of course the economic value will certainly soon start to lessen, and though further increases may be expected from the increased amounts of superphosphate, it may soon become a question of whether the increase in beans produced will be sufficient to meet the cost of the extra fertilizer applied. An answer to that question should be forthcoming after the next series of trials.

With respect to sulphate of potash, it will be noticed that no benefit can be attributed to its use. The yield of beans at the 1-cwt. level is actually lower than when sulphate of potash was omitted altogether though the difference is not significant. On the information obtained to date the inclusion of this fertilizer in a bean mixture for red basaltic soil is not warranted.

Though it is considered desirable that the Cooroy work be repeated next year, and the view is held that any results from this year's trials at this centre must be viewed with caution, it may be mentioned that in this area also no increase in yield was associated with amounts of sulphate of ammonia above 1 cwt. per acre. However, there was no

depression of yield in those Cooroy plots, on which higher levels of the nitrogenous fertilizer were used, as was the case at Buderim. At Cooroy the higher levels of superphosphate were associated with greater yields, though the results were not so clear cut there as at Buderim.

Sources of Nitrogen.

During the course of this work many growers from time to time have sought information concerning the best source of nitrogen in bean fertilizers. Actually at this stage of the main investigational work the question is not of great moment, though ultimately it will definitely have to be answered. However, this year, in order to get some leads on the matter, a small test was laid down at the Nambour Field Station and three sources of nitrogen were employed. These three—sulphate of ammonia, nitrate of soda, and blood—were each combined with the same mixture of superphosphate and sulphate of potash. On yields, sulphate of ammonia gave the best results, blood was second, and nitrate of soda last. The view has been expressed that blood appears to enable the plants to survive longer and thus perhaps give an extra picking. This may be so, but such a performance would not necessarily be meritorious. It may be better to get the beans off more quickly even if a slightly smaller yield is obtained. Furthermore, the figures obtained this year, in so far as nitrogenous fertilizers are concerned, do not suggest that blood will give the highest obtainable yield. It should be emphasised, however, that this is not a final answer concerning sources of nitrogen and more detailed work may lead to a different conclusion. It must be remembered that during this year the work for the most part was carried on under drought conditions.

Fertilizer Placement.

It was not possible to carry out any extensive experiments on the placement of fertilizers, but one small experiment was carried through successfully. In this, the fertilizer was applied in four different ways—viz., broadcast about ten days before planting, placed 4 inches to the side and slightly below the seed at planting, placed 4 inches to the side and slightly below the level of the seed soon after germination, and placed 2 inches directly beneath the seed at planting. These plots were replicated six times and were spray-watered as required throughout their growing period. In spite of the very adverse weather conditions, including the incidence of abnormally heavy frosts, fair yields were obtained and, on the figures, the method of fertilizing in the furrow below the seed at planting was outstandingly the most successful. The result was so definite that there appears no necessity to repeat the work.

Recommendations.

Although there is still a great deal to be learned concerning the fertilizing of beans, some of the information which has been obtained can be safely applied at least for the time being. Thus a nitrogenous fertilizer is required, but the amount of this should not exceed the equivalent of 1 cwt. of sulphate of ammonia per acre. Superphosphate is even more definitely necessary, but the maximum economic ration of this fertilizer is not yet known. Amounts up to 3 cwt. per acre can be confidently expected to increase yields, and the indications are that appreciably more than that quantity will be found beneficial. The position with respect to potash is still a little obscure in the case of

some soils, but so far there is no evidence which can be taken as suggesting that its inclusion in a bean fertilizer is warranted. Certainly the amount used should be very small. The placement of fertilizer experiment needs no amplification; the fertilizer is best applied directly below the seed at the time of planting and not more than 4 nor less than 2 inches beneath the seed.

RISKS OF TOO-DEEP PLOUGHING.

There is plenty of evidence to show that many growers, particularly those farming the acid-alluvial soils, are ploughing too deeply when preparing the land for planting, in the Innisfail-Tully district.

In most fallow fields an abundance of raw sub-soil is apparent on the surface, and mixed with the fertile surface soil. Where this has occurred, decreased crop yields will necessarily follow and corrective measures will be slow and costly.

While it is desirable to have a deep, fertile soil the process of deepening should be done gradually, and not more than ½ inch to 1 inch of the sub-soil ploughed up during each crop rotation. More attention should be paid to depth of furrow when ploughing, and if much sub-soil is being disturbed the plough should be lifted until a minimum is being brought up.

It might be argued, in some cases, that unless the plough is kept at a depth at which much sub-soil is brought up it is not possible to obtain a deep, friable seed-bed in which to plant the sett. In these circumstances it would be much better to keep the plough at a safe depth and create a deep, friable seed-bed by grubbing deeply prior to planting, or sub-soiling when ploughing, and in this manner improve the depth of tillable soil.

—H.G.K., in *The Cane Growers' Quarterly Bulletin.*

SOIL EROSION- -THE HIGH COST OF DOING NOTHING.

Nations and national cultures have died of soil erosion, and if we do not look out, that will be our fate, too.

"The Greeks grew rich and their culture was in flower while their soil was slipping under their feet. It seems unlikely that the bare, rocky hills of Greece could to-day support a culture that would compare with the past." And so also of Palestine, North Africa, parts of Italy; and even in England and Scotland; and in China and Peru, the world is moth-eaten by man. Through it all runs the old story of terracing and careful farming ruined by wars, by greed, and by every force of human stupidity.

In dealing with the problem of soil erosion, a country may easily die of economy—that is, when land and money meet in a head-on collision. The cost of soil conservation may sound tremendous—that is, the cost of doing *something*; but the cost of doing *nothing* is certainly stupendous.

Introduced Legumes in North Queensland.

J. LEEMING SCHOFIELD, Director, Bureau of Tropical Agriculture.

SUMMARY.

A TRIAL carried out at the Bureau of Tropical Agriculture, North Queensland, with numerous legumes comprising temperate, subtropical and tropical types is described.

Results indicate that certain tropical legumes are satisfactory under coastal conditions in North Queensland, but temperate legumes are markedly unsuccessful.

Information on the distribution, characteristics, planting and feeding value of the following tropical legumes is given:—*Stylosanthes guianensis* (Stylo), *Stylosanthes guianensis*, var. *subviscosus* (Hairy Stylo), *Centrosema pubescens* (Centro), *Pueraria phaseoloides* (Puero), *Calopogonium mucunoides* (Calopo), *Cajanus indicus* (Pigeon pea) and *Crotalaria usaramoensis* (Croto).

The possibilities of use of the above tropical legumes for pasture, grassland renovation, green manuring and soil conservation is discussed.

INTRODUCTION.

One of the chief limiting factors to satisfactory grassland development in North Queensland is the lack of suitable legumes. It was considered advisable, therefore, to carry out an extensive trial at the Bureau of Tropical Agriculture to determine which types are satisfactory for commercial practice. Numerous temperate and tropical legumes were selected, and the results are of importance as they indicate quite clearly the class of legume for future study. The trial was situated in the tropical rain forest belt, and the results are not only of value to North Queensland but to Papua, New Guinea, and certain other parts of the Empire within the tropics.

The tropical rain forest of North Queensland lies to the east of the 150 Meyer Ratio isolog, and this area is mentioned by McTaggart as definitely favouring the establishment of exotic plants. Results from the trial indicate the suitability of this belt in North Queensland for the introduction of exotic plants obtained from tropical rather than temperate regions. The work of Davidson, Prescott, and Trumble at the Waite Institute on agroclimatology and bioclimatic zones, using the ratio of mean monthly rainfall to saturation deficit is of considerable value in making comparisons of this nature.

The tropical legumes in the trial have been studied for the possibility of using them for one or more of the following purposes:—(1) Pasture, (2) Grassland Renovation, (3) Green manuring, (4) Soil conservation. Promising types have been selected for each category mentioned above, and experiments are now in progress to determine the economic usefulness of these legumes for the development and closer settlement of one of the richest areas of Australia, namely that of the tropical rain forest of North Queensland.

As pasture forms the mainstay of Australian agriculture, particularly in Queensland, special attention has been given to the selection of

promising legumes for grassland development. During 1939-40 it is estimated that the returns from grassland farming in Queensland, quoting figures recently given by the Premier, Hon. W. Forgan Smith, will approximate to £30,200,000 out of a total of £44,000,000 for the four chief products of the primary industries—wool, meat, butter, and sugar. North Queensland has always been at a disadvantage compared with the southern States, by the lack of a satisfactory pasture legume, and one of the chief objectives, therefore, of this investigation was to select for further and more comprehensive tests, promising pasture legumes.

LEGUME TRIAL.

The trial included 131 types, consisting of tropical, sub-tropical, and temperate legumes; 43 of these legumes, including all the lucernes, were planted with the following treatments in duplicate:—

(1) 1 ton lime, 6 cwt. superphosphate per acre.

(2) 1 ton lime, 4 cwt. superphosphate per acre.

(3) 1 ton lime, 1 cwt. superphosphate per acre.

The remaining legumes were planted on soil which had previously been treated with 3 tons of lime to the acre ploughed under, and a dressing of 4 cwt. of superphosphate was applied prior to planting. The average pH of the soil in this trial before liming varied between 4.5 — 4.8.

Strain is particularly important in a trial of this nature, and accordingly numerous strains were included. The bacteriological aspect of the investigation has received attention, and inoculated and non-inoculated plants have been compared. Experiments with inoculated and non-inoculated seedlings of the various legumes at the Bureau have not resulted in any differences in growth or vigour. There would appear to be no necessity, therefore, for seed inoculation in the several coastal districts so far examined. But investigation on this matter is proceeding, and it is possible that seed inoculation will be required for satisfactory development in certain areas. It is also possible that different strains of *Rhizobium* will be isolated for use under varying soil and climatological conditions.

One general conclusion can be drawn from this trial: temperate legumes are useless under coastal conditions in North Queensland. Twenty-five different types of lucerne, ten species of *Trifolium*, numerous *Lespedeza* species, and other members of the bean family were included, but not one representative of the temperate legumes showed promise in any treatment. By contrast, however, certain tropical legumes achieved considerable success. The growth of these legumes is particularly vigorous. A carpet of thick cover several feet in depth is produced by the creeping legumes which smothers out weeds and acts as an effective guard against soil erosion. These tropical legumes are persistent, they produce dense cover throughout the year, and are capable of withstanding excessive heat, extremely heavy rainfall, and periods of relatively dry weather.

William Davies, of the Welsh Plant Breeding Station, Aberystwyth, in pamphlet No. 39, Council for Scientific and Industrial Research, "The Grasslands of Australia and Some of Their Problems," makes the following statement which deserves special attention: "Concerning the species problem in Queensland pastures, there are two obvious alternatives involving the study of two contrasting sets of

plants. It is desirable to determine in Queensland whether the indigenous or other tropical pasture plants are worth dealing with in detail. Is it worth while, for example, doing plant breeding and selection work upon them, or is it better to concentrate upon temperate plants of recognised value and to find means of building them into swards under tropical conditions?" Under conditions on the North Queensland coast, this trial indicates that work on tropical legumes is producing results which may be of considerable value for grassland development, should the experiments which are being carried out to determine reaction to grazing and the resultant effect on the animal prove satisfactory.

TROPICAL LEGUMES.

"Stylo" (*Stylosanthes guianensis* Sw.).

Native Habitat and Distribution: A native of the sandy soils of Brazil where it is reported as very valuable for pasture or hay, its nutritive value, being fully equal to that of lucerne; vernacular name "Trifolio." Introduced into Queensland in June, 1933, by the Department of Agriculture and Stock from Brazil and growth at Sarina, Tully, and Innisfail has proved satisfactory. Trials have been laid down on numerous farms along the tropical north coast and the hinterland, to determine the limits of commercial application.

Common Name: For ease of reference this legume has been called "Stylo."

Description: A perennial with trifoliate leaves, each leaflet acute. Small yellow flowers produced at the upper nodes of the stems, each inflorescence having 10-15 flowers; each pod contains a single seed.

Planting: The number of seeds per lb. is approximately 120,000; scarification by grinding with sand or other suitable method should be carried out before planting, as this treatment increases the germination by as much as 40 per cent. Successful plantings can be made using cuttings of 6 inches to 8 inches long containing 4 or more nodes if put out at the commencement of the wet season. Seeding at from 1-4 lb. per acre according to circumstances is suggested.

Feeding Value: High; and in palatability trials this legume has been readily consumed. At South Johnstone, grazing trials alone and in combination with different grasses indicate that in the early stages of growth this legume appears to be rather unpalatable to cattle. This valuable property may prove of great importance, for, when it is considered in combination with its vigorous growth, perennial habit, and ability to produce seed, it simplifies considerably establishment and persistency in widely varied types of grassland.

Uses: This legume is the most promising pasture component to date in North Queensland; it is aggressive and able to withstand successfully heavy rainfall and relatively dry conditions, but initial growth is slow. Stylo flourishes on the red soils of the Innisfail area, particularly on well drained hillsides, it thrives on acid soils, but it is intolerant of swampy conditions. Once established it is capable of spreading by means of its free-seeding habit, even when in competition with weeds and inferior grasses. Stylo shows great promise as a pasture legume of high value, suitable to the tropical conditions of North Queensland, and deserves widespread trial.

"**Hairy Stylo**" (*Stylosanthes guianensis* Sw. var. *subviscosus*).

Native Habitat and Distribution: Native to Brazil, vernacular name "Meladinho;" recently introduced into Australia by the Council for Scientific and Industrial Research.

Plate 136.

ILLUSTRATING THE ASSOCIATED GROWTH OF STYLO AND BRACHIARIA DECUMBENS IN A GRAZING EXPERIMENT; FIVE MONTHS OLD, GROWN ON SUGAR-CANE LAND AT THE BUREAU OF TROPICAL AGRICULTURE.

Common Name: For ease of reference, this legume has been called "Hairy Stylo."

Description: Closely related to the preceding species but distinguished by its lighter-coloured, narrower, and smaller leaves and sticky exudation from the hairs. A valuable fodder plant with a yield slightly lower than Stylo. The initial growth is particularly good on the North Queensland coast.

The above two legumes are quite distinct from Townsville lucerne, *Stylosanthes sundaica* Taub. (syn. *S. mucronata* Willd.). This latter species is a summer-growing, self-regenerating annual; it is much smaller and does not possess the vigour and body of Stylo. Under low rainfall conditions, however, and on soils of low fertility, Townsville lucerne is a most useful legume.

"**Centro**" (*Centrosema pubescens* Benth).

Native Habitat and Distribution: Native to South America, but found wild in Java in 1921; used extensively as a cover crop in the East; introduced into Australia by the Council for Scientific and Industrial Research.

Common Name: For ease of reference, this legume has been called "Centro."

Description: A perennial twining herb with trifoliate leaves forming a compact cover over the ground about 1½ feet deep. It is aggressive and hardy although initial growth is rather slow. Climbs readily and is an effective weed-smother crop; it will thrive under shade. The pods are 5-6 inches long, flat in appearance, and contain up to 20 seeds.

Effective Life: Will continue to thrive for many years in the East if the soil is sufficiently fertile; under conditions on the North Queensland coast growth is good, even during winter. Prolific flower and seed production occurs, to a much greater extent than in the East, and thus under natural conditions a rapid spread of this legume is assured.

Palatability: Good; tests are in progress on the grazing of Centro alone and in combination with various grasses.

Planting: The number of seeds per lb. is approximately 15,000. Seeding at the rate of 5-6 lb. per acre is suggested.

Plate 137.

A CROP OF CENTRO FIVE MONTHS OLD, ILLUSTRATING THE DENSE COVER FORMED NEARLY 1 FOOT IN DEPTH, GROWN ON SUGAR-CANE LAND AT THE BUREAU OF TROPICAL AGRICULTURE.

"**Puero**" (*Pueraria phaseoloides* Benth; syn. *P. javanica* Benth.).

Native Habitat and Distribution: Indigenous to Malaysia, used extensively as a cover crop in the East; introduced into Queensland in October, 1933, by the Department of Agriculture and Stock from the Department of Agriculture, Peradeniya, Ceylon.

Common Name: For ease of reference, this legume has been called "Puero."

Description: A vigorous perennial twining herb often producing primary runners more than 30 feet long with numerous secondary shoots; forms a dense cover about 2-3 feet deep. Leaves large, trifoliate, hairy. Flowers in scattered pairs in racemes; mauve in colour. The pods are 3-4 inches long, rather cylindrical in shape and contain

approximately 18 seeds. Seeds small, brown in colour. As a weed-smother crop this aggressive legume is unsurpassed, but initial growth is rather slow. Climbs readily, and will grow under shade.

Effective Life: Continues to thrive for many years in the East on fertile soils. Growth on the North Queensland coast is good, even during the winter, flowering occurs and seed is set readily under satisfactory conditions, whereas in Malaya it is a rather shy flower producer.

Palatability: Taken readily by cattle; grazing trials alone and in combination with various grasses are now in progress. In a recent grazing trial at the Bureau, Puero was eaten with relish.

Planting: The number of seeds per lb. is approximately 37,000. Seeding at the rate of 3-4 lb. per acre is suggested, or planting cuttings 2-3 feet long, two per point 4 feet by 4 feet.

Plate 138.

A Crop of Puero Five Months Old, demonstrating the Strongly Aggressive Nature of the Legume; the Dense Cover is 2 feet deep, Grown on Sugar-cane Land at the Bureau of Tropical Agriculture.

"**Calopo**" (*Calopogonium mucunoides* Desv.).

Native Habitat and Distribution: A native of tropical America, introduced to the East as a cover crop. Seed obtained in Australia through the Council for Scientific and Industrial Research.

Common Name: For ease of reference, this legume has been called "Calopo."

Description: A vigorous aggressive creeping herb forming a dense mat of foliage 1-2 feet deep of trifoliate hairy leaves. Flowers produced in short racemes, small, pale blue in colour. Climbs readily but will not thrive under shade. It is a valuable cover for newly-cleared land where it is not intended to sow it immediately to grass; it develops quickly and soon covers the ground. Not so hardy as Puero and Centro, but the rapid initial growth of Calopo makes it a desirable legume for

mixing with these two covers which develop more slowly. On cultivated land, however, Puero alone is preferable, as Calopo and Centro produce seed freely.

Effective Life: In the open this cover will persist for many years as seed production is profuse and natural regeneration occurs. Under shade, however, Calopo soon disappears. It is not so hardy as Puero and Centro.

Palatability: Trials indicate that although not eaten with relish it is not unpalatable.

Planting: The number of seeds per lb. is approximately 33,000. Seeding at the rate of 3-4 lb. per acre is suggested.

Plate 139.

A CROP OF CALOPO TEN MONTHS OLD, SHOWING THE THICK COVER OVER 1 FOOT IN DEPTH, GROWN ON SUGAR-CANE LAND AT THE BUREAU OF TROPICAL AGRICULTURE.

Pigeon Pea (*Cajanus indicus* Spreng; syn. *Cajanus cajan* Linn.).

Native Habitat and Distribution: Indigenous to India, Burma, West Indies, Tropical Africa, New Guinea, and Malaya. Widely distributed throughout the tropical belt.

Description: An upright shrub 6-8 feet high with narrow trifoliate leaves and thin branches. Flowers small, usually yellow but in certain forms the dorsal side of the standard is dark red; the pods vary in length from 2-5 inches. Many new strains of this legume have been produced in Hawaii where it is used for cattle fattening and as a green manure. This useful plant grows well under North Queensland conditions, and promises to be a valuable legume for stock feeding and a satisfactory green manure; it possesses a large tap root which is useful in opening up the soil. Although this long-established legume has not proved popular in the southern part of the State, it is well worthy of trial in North Queensland as an edible mineral-efficient legume sown in strips across pastures, a technique advocated—using appropriate plants—by that great exponent of grassland development, Sir R. G. Stapledon.

Effective Life: Depends on the strain; with systematic pruning or feeding off, the crop may last from 15 months to 5 years.

Planting: A rate of 5 lb. seed per acre is suggested.

General: The pigeon pea is a crop which deserves the attention of farmers on the tropical north coast, it is a useful stock feed and an excellent green manure. Yields up to 35 tons per acre equivalent to 500 lb. nitrogen per acre have been obtained for green manuring. The dried split peas are an excellent article of diet, and contain more protein and fat than either soybeans or alfalfa; the average yield of cleaned peas per acre is from 500 to 1,000 lb.

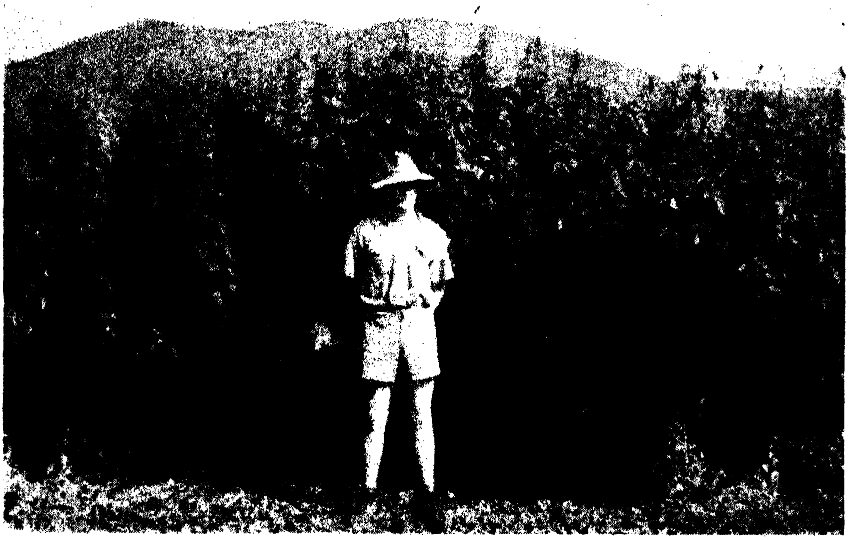


Plate 140.

AN AVERAGE CROP OF PIGEON PEA EIGHT MONTHS OLD GROWN ON SUGAR-CANE LAND AT THE BUREAU OF TROPICAL AGRICULTURE.

"Croto" (*Crotalaria usaramoensis*).

Native Habitat and Distribution: Indigenous to tropical East Africa, successfully introduced in British Honduras, Burma, Ceylon, Malaya, North Borneo, and the Dutch East Indies.

Common Name: For ease of reference, this legume has been called "Croto."

Description: A large erect shrub 9-12 feet high with a free branching habit, rather similar to *C. anagyroides*, but differs in possessing smaller flowers, deflexed pods and it does not produce woody growth to the same extent.

Effective Life: Approximately 18 months to 2 years, it can withstand pruning and thrives on a wide variety of soils. Growth in the wet belt of the North Queensland coast is particularly good, a height of 10 feet being attained; seed is produced freely.

Planting: The number of seeds per lb. is approximately 127,000 (compare *C. anagyroides* at 24,000 to the lb.). Seeding at 5 lb. per acre is suggested for row planting, but if broadcast, a considerably higher rate should be used.

TROPICAL LEGUMES FOR PASTURE PURPOSES.

Very little is known concerning the possibility of using tropical legumes for pasture. Palatability tests have been conducted, and grazing trials are now in progress, using Stylo mixed with various grasses. Grazing experiments with Stylo, Calopo, Centro, and Puero alone, and in combination with different grasses have been laid down to determine the effect of continued grazing on the legume and on the animal. The development, habit and free seeding nature of these tropical legumes show promise for pasture work and the above experiments will determine whether they can be utilised successfully.

When it is realised that several experiment stations have shown that dairy and beef products may be produced on practically an entire grass and legume ration at a considerably greater profit than on more concentrated rations, the importance of finding satisfactory tropical legumes for pasture purposes can be visualised. At the Middle Tennessee Experiment Station, finished beef is being produced on an all-year pasture-hay ration (with only a small addition of cotton-seed meal) at a considerable profit over the usual pasture-grain feeding. There are thus great opportunities on the Queensland tropical north coast for beef production using improved grasses and tropical legumes.

TROPICAL LEGUMES FOR GRASSLAND RENOVATION.

An experiment on weed control using Puero as a smother crop was commenced at the Bureau in 1939. Planted at 8 feet by 8 feet, Puero produced an effective check on weed growth, and at 4 lb. per acre the thick mat of leguminous cover effectively repressed all weeds. Calopo also has proved satisfactory in this respect, and its quick growth makes it an excellent cover to mix with the aggressive, but rather slow growing Puero; as, however, Calopo seeds very freely, care should be taken not to employ this cover on cultivated land as a long-period green manure. The aggressive nature of these tropical legumes, combined with their perennial habit, indicate that they may be used for grassland renovation and careful attention is being given to this matter.

TROPICAL LEGUMES AS GREEN MANURES.

The tropical legumes mentioned have not as yet been used as green manures under North Queensland conditions, but the evidence obtained from the trials conducted at South Johnstone indicate their value as short and long-period cover crops. These legumes can be divided into two categories namely, upright and creeping cover crops.

(*a*) *Upright Green Manures.*—The pigeon pea is a good example of this type. It produces a heavy bulk of easily decomposable vegetable matter, and it can be used for stock feeding if required. Ploughing under presents no difficulties, and if desired it can be ratooned and a second and third crop obtained. Croto is another example of a promising upright green manure.

(*b*) *Creeping Green Manures.*—Puero shows promise for a long-period green manure. Calopo may be of value as a short-period cover, and further investigation is being undertaken on this matter. Judging from the results obtained in the trials at South Johnstone, these tropical creeping legumes may be of considerable value in raising fertility and improving soil texture under North Queensland conditions.

TROPICAL LEGUMES USED FOR SOIL CONSERVATION.

In Malaya, Calopo, Centro, and Puero are used to prevent soil erosion, particularly the two latter covers. The vigorous growth exhibited by the above legumes under coastal conditions in North Queensland indicates that they may also be of considerable value for soil conservation in this area, when used in conjunction with up-to-date methods, and the possibilities of economic use are being investigated.

DISCUSSION.

The promising creeping tropical legumes Calopo, Centro, and Puero are new to North Queensland, but they are used extensively in Ceylon, Java, Malaya, and Sumatra as plantation cover crops. It is interesting and instructive, therefore, to compare and contrast the climatic differences existing between say, Malaya, and the portion of North Queensland to which this experiment refers. In both areas the climax vegetation is tropical rain forest with its mixed botanical composition, although Malaya is situated north of the equator between 1 degree and 6 degrees latitude, and the main portion of North Queensland lies south of 15 degrees latitude (south). The climate of North Queensland is fundamentally different to that of Malaya in two important particulars: it possesses a winter season, and a prolonged period of wet weather. Malaya by comparison has no winter, the rainfall is more evenly distributed, and the temperature range is much smaller. In Malaya, the total annual rainfall varies from 88 inches to 140 inches, depending on the locality, while on the North Queensland coast, the precipitation ranges from 60 inches to 160 inches. The mean minimum and maximum temperature for twelve months in Malaya is from 70 degrees to 90 degrees F., and is practically uniform throughout the year. On the North Queensland coast, however, the figures approximate to 65 degrees to 82 degrees F. with a marked seasonal variation, the mean minimum monthly temperature being as low as 13 degrees F. below the corresponding figure for Malaya. This seasonal variation in North Queensland, with the accompanying difference in length of day, serves as a great stimulus to flower production in tropical legumes, which results in greatly enhanced yields of seed as compared with the same legumes under Malayan conditions. In Malaya, for example, Puero rarely sets seed, but by virtue of its vigorous vegetative habit this aggressive perennial forms a dense cover. Under North Queensland conditions, Puero assumes an added significance, for in addition to its vigorous vegetative growth, seed production also occurs under suitable conditions. This seeding habit in a perennial, which possesses great power of spreading vegetatively by means of rooting along the runners, provides a legume which offers great possibilities as a long-period cover. Seeding occurs to a much greater extent with Calopo and Centro, and although in Malaya these two legumes seed freely, seed production in North Queensland is much heavier. It would appear, therefore, that these tropical legumes may be of even greater value under conditions in North Queensland than in Malaya. Stylo has not been grown in the East to my knowledge to-date, but in North Queensland the possibilities of use for pasture purposes are most promising. It thrives under a wide range of conditions, and grazing tests with it alone and in combination with selected grasses are in progress.

A factor of considerable importance in these investigations with tropical legumes is that they thrive on acid soils. This fact provides the farmer with an urgent necessity in many areas of North Queensland, namely legumes for soils with an acid reaction.

ACKNOWLEDGEMENTS.

The author's thanks are due to officers of the Council for Scientific and Industrial Research for supplying seed of numerous legumes; to Mr. C. R. Mulhearn, Director of the Animal Health Station, Oonoonba, for the conduct of palatability trials on numerous tropical legumes; and to Mr. J. Hart for assistance with the experiments.

REFERENCES.

BUNTING, B., and J. N. MILSUM.—Cover Crops and Green Manures, Malayan Agric. Jour. 16, 1928.

DAVIDSON, J.—Coun. Sci. Ind. Res. Bull. 79, 1934.

DAVIDSON, J.—Trans. Roy. Soc. S. Aust., 60:88, 1936.

DAVIES, W.—The Grasslands of Australia and Some of Their Problems. C.S.I.R. Pamphlet 39, 1933.

KRAUS, F. G.—The Pigeon Pea (*Cajanus indicus*). Its Improvement, Culture, and Utilisation in Hawaii, 1932.

MCTAGGART, A.—Stylosanthes. Jour. Coun. Sci. Ind. Res., 10, 1937.

MCTAGGART, A.—*Ibid.*, 12:151, 1939.

PRESCOTT, J. A.—Jour. Aust. Inst. Agric. Sc. 4:33, 1938.

STAPLEDON, R. G.—The Land Now and To-morrow.

TRUMBLE, H. C.—The Climatic Control of Agriculture in South Australia. Trans. Roy. Soc. S. Aust., 61, 41, 1937.

WELTON, K.—Saving Soil with Sod in the Ohio Valley Region. Farmers' Bull. No. 1836 U.S. Dept. Agric. 1939.

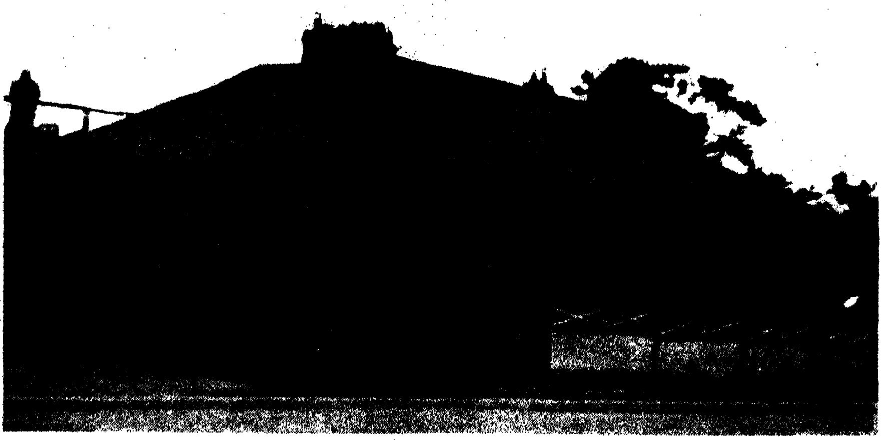


Plate 141.

THE "CRADLE" OF THE AUSTRALIAN WHEAT INDUSTRY.—"Experiment Cottage," the Parramatta home of James Ruse, who planted in its grounds the first wheat grown in Australia.

Poultry Farming in Queensland.

(*Continued from page* 331, *October*, 1941.)

THE FEEDING OF CHICKENS.

In the feeding of chickens it is most important to bear in mind that nature has provided for the first day or so of the chicken's life, as just prior to hatching the balance of the egg yolk is drawn into the abdomen of the chick. Most breeders allow at least forty-eight hours to elapse before feeding. Chickens fed earlier are subject to bowel trouble. If, however, feed is withheld after the forty-eight hours, weakness develops, from which many chickens will not recover.

Requirements of Growth.

Chickens make very rapid growth in the early part of their life. This development is most rapid during the first six to eight weeks, consequently rations having a relatively high protein content are necessary to give the best development. From experimentation it has been established that rations having a crude protein content of 18 to 20 per cent. should be used during the first six to eight weeks, and after that period this should be reduced to 15 per cent. The protein requirement of a chicken does not alter as sharply as this, but these periods and protein content are suggested as meeting the practical requirements of the poultry-raiser.

The practice adopted by many poultrymen of reducing the protein content of a ration after the chickens are about sixteen weeks of age in order to delay sexual development is desirable if the birds are maturing too rapidly. Development, however, can be controlled to only a very limited degree, and the danger of under-feeding protein must be avoided. On the other hand, excessive protein feeding must be guarded against, as the over-feeding of protein-rich foods causes deposits of urates in the ureter, kidneys, and other organs, and may place an undue strain upon the liver.

It is generally conceded that milk is the most desirable protein feed for chickens and growing stock, but owing to its cost its exclusive use is not always possible. Wherever possible milk should form a portion of the ration. It may be given in the form of curds, semi-solid milk, butter-milk, or butter-milk powder. As a drink, milk is excellent, but it is objectionable because of the difficulty of keeping chickens clean. Butter-milk powder is favoured because of the ease with which the powder may be incorporated in the mash, thereby controlling the kind of food that each chicken consumes. Apart from its concentration, however, it has no definite advantage from a feeding value point of view. Proteins build flesh, but at the same time a bony framework is necessary. Analysis of the chicken at different ages, according to Halnan, indicates that it is particularly important to allow for the mineral requirements from the eleventh to the twenty-fourth week. In all experiments conducted by this Department, provision has been made for increased mineral intake by the addition of bonemeal to the mash at eight weeks of age, and by allowing the birds free access to grit (shell and hard).

The following table showing the food consumption of chickens has been compiled as a result of actual experiments conducted in this State, the ration used being as set out in Table III.:—

TABLE II.

FOOD CONSUMPTION OF CHICKENS.

Age.	Leghorns.		Australorps.	
	Weight of Chickens.	Food Consumed Weekly.	Weight of Chickens.	Food Consumed Weekly.
	Oz.	Oz.	Oz.	Oz.
Day old	1·3	..	1·36	..
1 week	1·97	1·64	2·14	1·53
2 weeks	3·31	3·36	3·61	3·32
3 weeks	5·31	4·80	5·84	5·05
4 weeks	7·61	6·46	8·68	7·20
5 weeks	9·94	7·58	12·08	6·89
6 weeks	12·92	8·96	15·86	10·62
7 weeks	16·65	8·65	20·17	13·95
8 weeks	20·41	13·29	25·31	15·05

The variation in weight from week to week and the ever-increasing amount of food required suggest the undesirability of laying down hard and fast rules as to what quantity should be supplied.

The food requirements increase week by week, and a system of feeding which enables the growing birds to consume all they require is the most desirable.

By reason of the fact that the kind of food consumed is easily controlled, and that it is always in front of the birds, the all-mash system of feeding chickens is suggested as being the most desirable. All-mash should be placed in shallow trays about 1 inch in depth during the first few days. Trays of a depth of 2 inches should then be used, and by the end of the first week narrow trays or troughs 4 inches deep should replace these. At this age chickens will commence to scratch with more vigour, scattering the feed from the trough. This can be prevented by placing a piece of netting on top of the mash loose enough to sink as consumption takes place. During the first week 8 lineal feet of feeding space should be allowed for every 100 chickens, and later increased to 12 feet. Prior to the mash being covered with netting it is important that only a little food at frequent intervals be placed in the trays in order to avoid wastage.

In fact, the frequent feeding of all-mash appears to induce greater food consumption and better development.

Breeders who do not desire to feed an all-mash may make use of commercial chick grains and growing mashes which may be fed as directed by the manufacturers. It has been the custom for many poultry raisers to use scratch grain only for a short period of a chicken's life, but in view of the more satisfactory results obtained by feeding a ration of a relatively higher protein content than is usually contained in chick mixtures, early mash feeding appears essential.

Chickens may be reared satisfactorily upon moistened mashes and grain from about two weeks of age, but the mashes must be fed at frequent intervals. This system offers the advantage of utilising milk when available, as a medium of moistening the mash. The feeding of dry mash, however, is suggested as a safer method, as the possibility of food becoming sour and the probable consequent bowel trouble among chickens is avoided.

Suitable All-Mash Mixture.

The following mashes have been used successfully in experiments conducted by the Department, and are suggested as a basis upon which to work. At times it may not be commercially sound to adhere rigidly to the ingredients suggested, but from the table of analyses supplied it will be possible for the breeder to compound other suitable mixtures.

TABLE III.

——	1 to 8 Weeks.	8 Weeks to Maturity.
	Per cent.	Per cent.
Maize meal	40	60
Bran	20	13½
Pollard	20	13½
Meat and bone meal (63% protein)	7½	5
Dried buttermilk powder	10½	3½
Salt	1	1
Cod liver oil	1	1
Lucerne meal	..	2½

CARE OF MOULTING HEN.

It is a common practice among breeders to give little attention to moulting birds. In many instances they receive nothing but a grain ration. Feathers contain a considerable amount of protein, and the most economical manner of getting birds back into production is to feed protein-rich foods as provided in a laying ration. Moulting may be induced by the feeding of nothing but grain at or about the time birds usually moult. When once the moult has commenced laying rations should be supplied, as it will take about a fortnight for the manufacture of the first egg after the moult is completed.

FATTENING.

Two classes of birds have to be considered—old hens and cockerels. The ability of the feeder to do much with old hens in good condition is questionable, but those slightly out of condition may be improved with ten to fourteen days' crate feeding. From experiments it has been found economical to rear cockerels to the various marketing stages on the growing rations used for pullets. Ten to fourteen days of crate feeding for these birds would undoubtedly add to their market value. Old hens or young cockerels should be freed of external and internal parasites before being submitted to a fattening process. The crates could be small coops 2 feet wide, 3 feet deep, and 3 feet high. These crates hold about six birds, and if the floor is of wire-netting and above ground level the droppings will fall through and the birds will be kept clean. The front should be of wire or slats wide enough apart for the birds to get their heads through to feed from a trough in the front. An all-mash mixture of a relatively high protein content fed as a gruel three times a day will undoubtedly improve condition. With this system of feeding water is not necessary. Any food remaining after half-an hour should be removed in order to keep the appetite keen. A mash of equal parts maize meal and pollard, plus 10 per cent. buttermilk powder and 5 per cent. meat meal, is suggested.

MIXING OF MASHES.

On the majority of farms the various ingredients of a mash are either mixed with a shovel upon the floor of the feed room or in a trough.

If the mash is to be fed wet it is a good practice to soak the lucerne chaff or meal in water. Just sufficient water should be used to bring the mash to the correct consistency. The salt used in the mixture should be dissolved in the water first. This ensures equal distribution.

In making a dry mixture the salt should be added to the protein-rich foods in order to increase the bulk through which the salt is distributed.

When using cod or other fish liver oil, an equal distribution is ensured by first incorporating it in the bran.

Much labour will be saved and better mixing of the various ingredients ensured by using a mash mixer. An appliance that serves the purpose is easily constructed by the poultry raiser. The mixer consists of a drum constructed of 22-gauge galvanised sheet iron with tongued and grooved pine ends, as illustrated in Plate 142. A pipe of

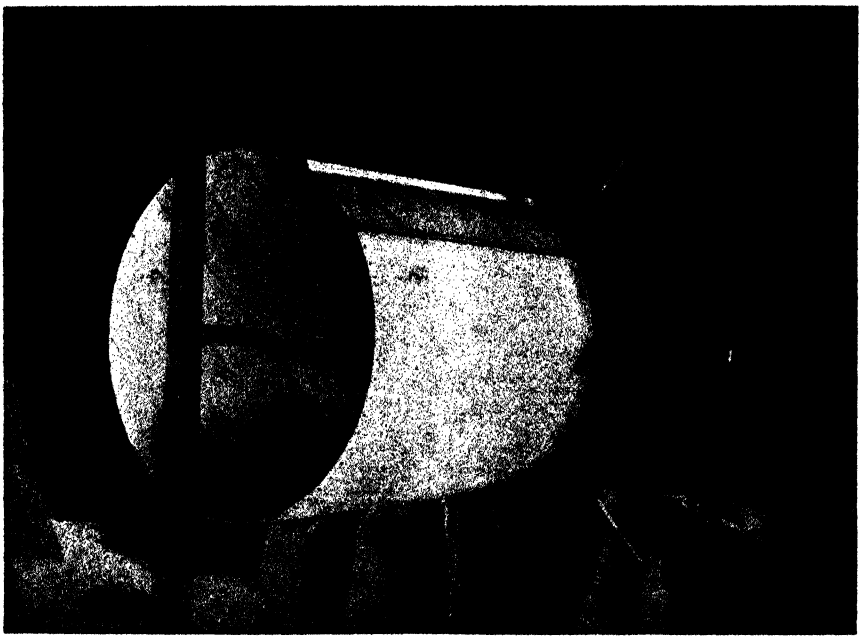


Plate 142.
A Handy Mash Mixer.

1¼-inch diameter is passed through the centre of the drum, fitting into hardwood bearings at each end. This pipe can be keyed to the drum by boring a hole through the pipe close to the drum and using a piece of No. 8 wire as a key. The No. 8 wire must be bolted to the drum.

The mash is mixed by a tumbling process, and to assist in raising the mash on the side of the drum while it is revolving, four battens should be attached lengthwise inside the drum 2 inches from the iron. The battens should be of 2½ by 1-inch timber.

The diameter of the drum is 3 feet 6 inches, and the length equal to the width of the iron. The sheet iron to pass around the drum must be riveted end to end, and the sides attached to the pine ends every 2 inches with screws. A convenient sized opening, the full length of the drum, must be left for filling. A sliding close-fitting door must be provided.

FEED HOPPERS.

Hoppers constructed to permit of ready access to the mash by the birds without food wastage are essential for efficient and economic feeding. Self-feeding hoppers which hold a large quantity of food are in general use, and they possess the advantage of economy in labour, as frequent distribution of mash is not necessary, but if these hoppers are not correctly made much feed wastage takes place. They are only suited to the feeding of dry mash. Frequent inspection is essential, as the mash sometimes clogs, and the hopper must be tapped to dislodge it.

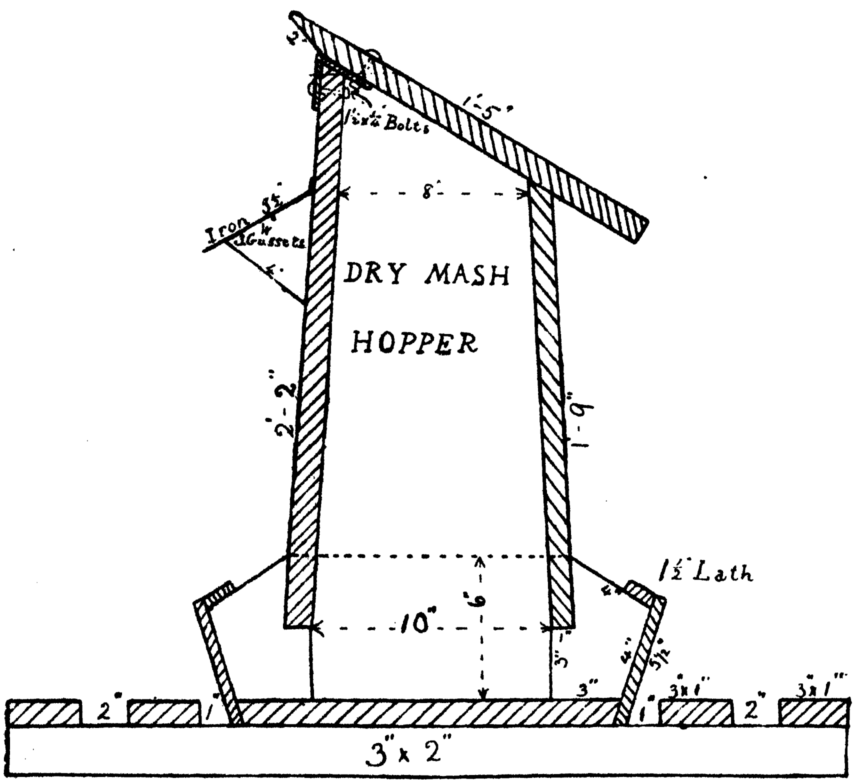


Plate 143.

A DOUBLE-SIDED SELF-FEEDING HOPPER.

The trough type of hopper is suitable for the feeding of both wet and dry mash as well as green feed. Only sufficient feed should be distributed to last the birds one or two days. Fresh mash appears more appetising to the birds, resulting in greater consumption and production. It is also possible from a casual inspection to determine whether

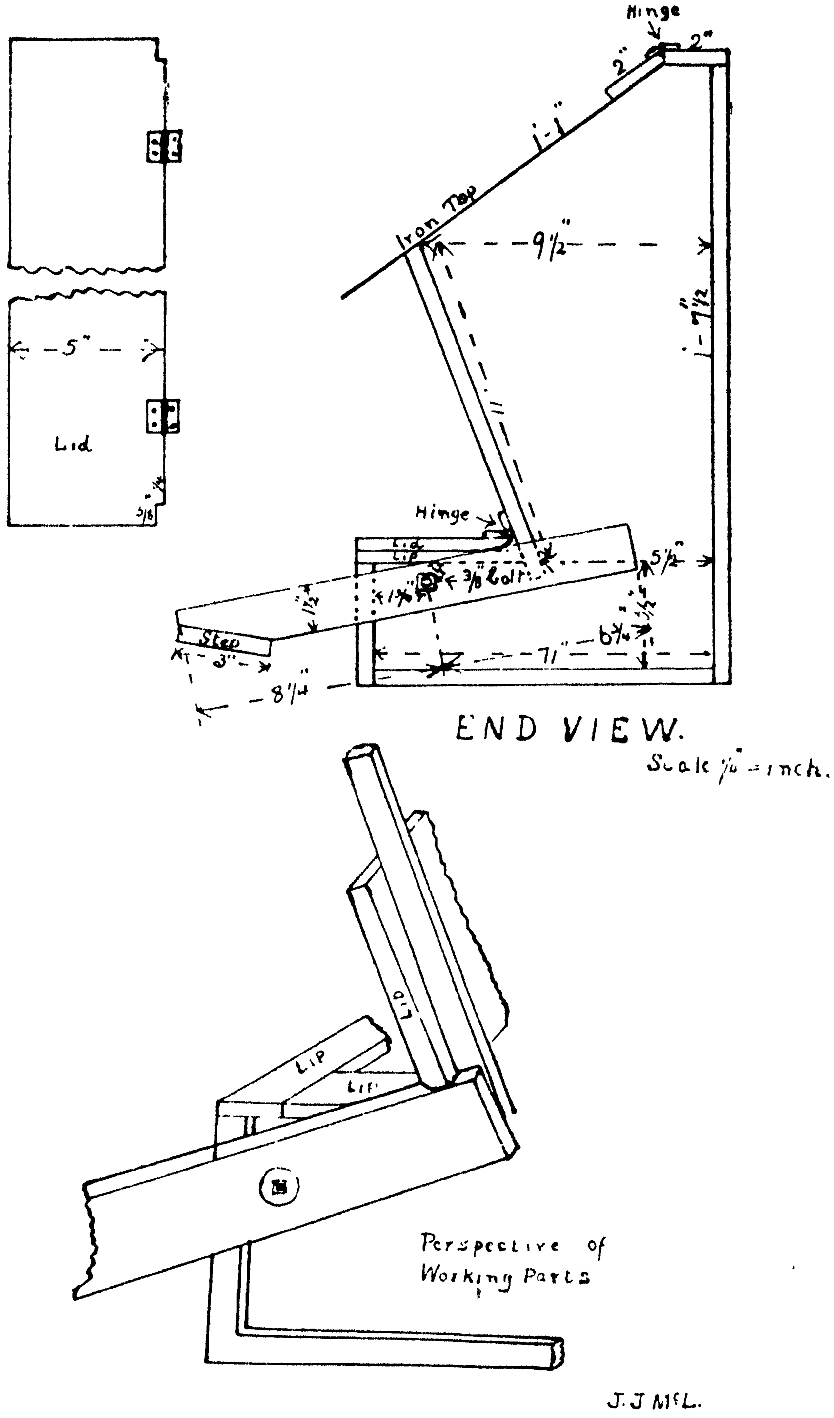


Plate 144.

PLAN OF AUTOMATIC FEEDING HOPPER.

the supply of food requires replenishing. The birds should be allowed to consume all the dry mash in the trough at least once per week to ensure that fresh mash is not being placed continually on the top of the stale.

When dry mash is being fed, 1 foot of hopper space should be allowed for every ten birds. When feeding wet mash, sufficient space should be provided to permit of all birds feeding at the same time, as the mash should be consumed before it dries out or spoils.

Plate 143 illustrates a double-sided self-feeding hopper that has proved very efficient. Plate 144, a self-feeder that automatically shuts off the mash when the bird leaves the hopper. Plates 145 and 146 illustrate a trough hopper with a reel over the centre. As small birds are able to gain entrance to the trough between the reel and side, smaller-sized hoppers are required for growing stock. Plates 147 and 148 illustrate a trough hopper with a slatted top. These slats, to some extent, reduce the feeding space, but they prevent food spoilage and wastage. Hoppers may be made to any length, but it is a good plan to restrict the length in order that one person can readily move an empty hopper. Trough hoppers 4 feet in length are suggested as the maximum, and the double-sided self-feeding hopper should be no longer than 3 feet.

GREEN FEED.

Green feed has long been recognised as an important food for poultry, and fowls of all ages relish it. It is relatively rich in vitamin A and has some feeding value apart from its protein and mineral content. If green feed is used in a wet mash the amount of green feed consumed is increased. It is probably one of the best means of adding bulk to the ration. Its use also improves the hatchability of eggs and the development of growing stock. The young, tender growing portions are the most valuable.

The quantity used depends upon supplies and general conditions. When fed by itself at midday, the birds should be given as much as they will consume, and when incorporated in the mash it may constitute 25 per cent. of the bulk of the mash. The green feed should be placed in hoppers and not thrown indiscriminately about the pens. During droughty periods, when poultry foods have been costly, green feed has been used with success to the extent of 60 per cent. of the bulk of the mash supplied, but as it is not highly nutritious and carries a good deal of moisture, the birds are unable to consume sufficient quantities in one feed, and two feeds of mash containing 60 per cent. should be given during the day with a full evening feed of grain.

As green feed is most suited to poultry when fed in the young succulent stage, a regular supply is only possible with some form of irrigation. The economic installation of an irrigation system is a problem that is best solved by individual producers. Where it is impossible to employ irrigation owing to the cost of plant or the inability to obtain a good supply of suitable water, and where the seasons are against the growing of green feed, substitutes in the form of lucerne chaff or silage are recommended.

Lucerne is probably the best crop to grow where soil and climatic conditions or irrigation facilities permit, as it is rich in protein, succulent, easily handled, and responds to repeated cuttings.

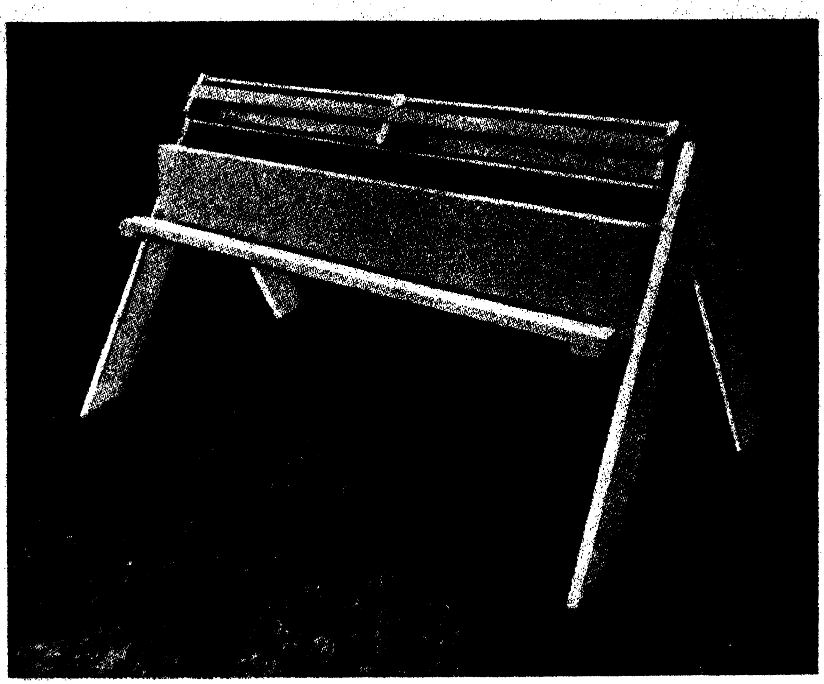


Plate 145.
TROUGH FEED HOPPER WITH ROLLER TOP.

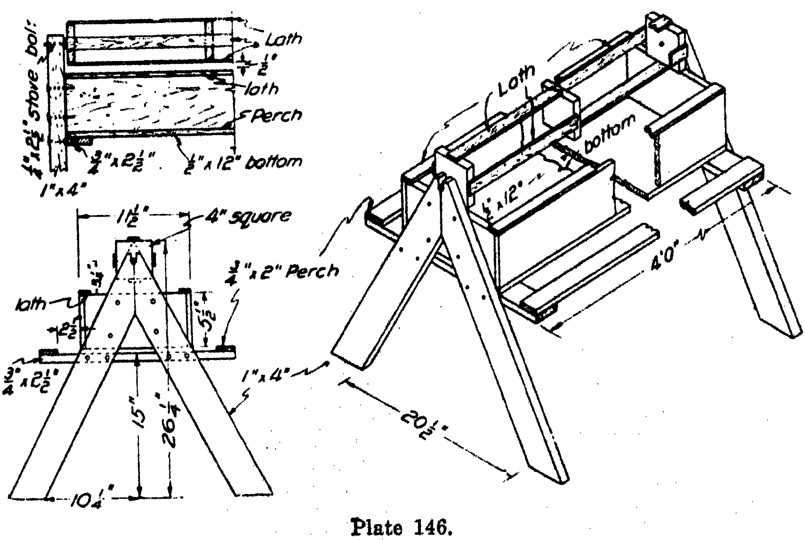


Plate 146.
PLAN FOR THE CONSTRUCTION OF TROUGH HOPPER SHOWN IN PLATE.

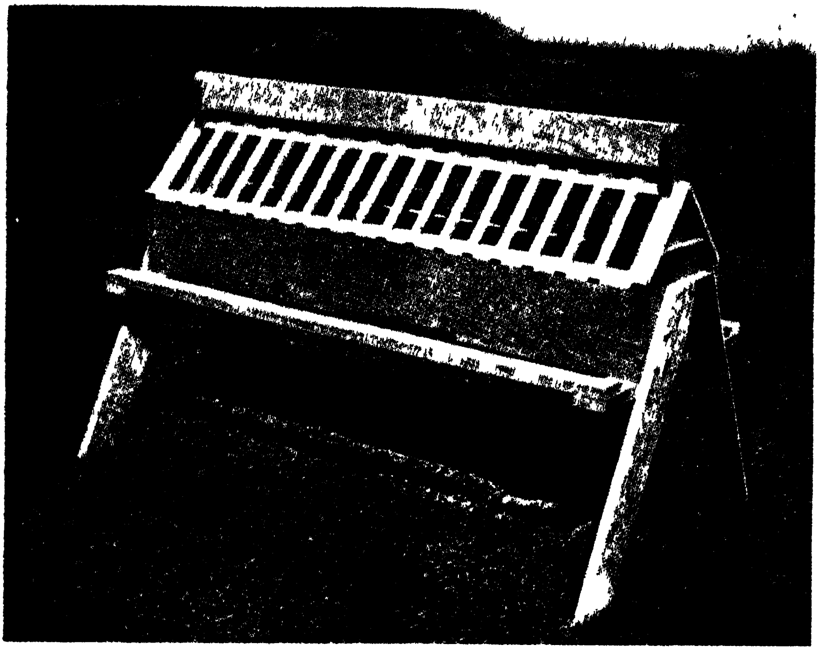


Plate 147.

TROUGH FEED HOPPER WITH SLATTED TOP.

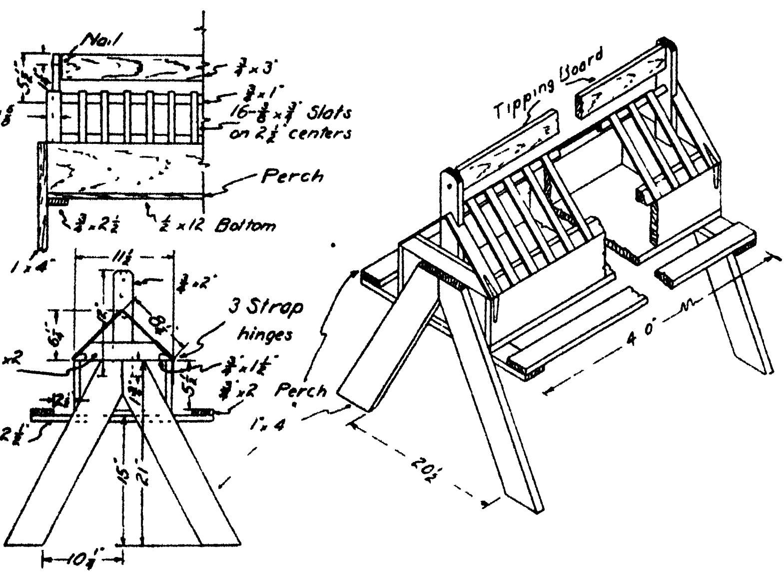


Plate 148.

PLAN FOR THE CONSTRUCTION OF TROUGH HOPPER SHOWN IN PLATE.

In districts where lucerne cannot be grown successfully, the finer-stemmed varieties of cowpea (summer) and the field pea (winter) will provide a useful substitute.

The millets, which include Japanese, white panicum, and giant panicum, provide a useful summer crop. They are early maturing, nutritious, and reasonably fine stemmed. Because of their habit of quick growth, however, succession sowings of millets are necessary to provide succulent feed over the summer season.

Young maize is also valuable, but this crop rapidly becomes coarse.

The winter cereals—wheat, oats, barley, &c.—are particularly useful in season, and will provide excellent feed over a long period. Rape is also suitable for autumn sowing and may be fed to poultry without chaffing.

Although grasses are primarily suitable for open range, succulent grasses, such as kikuyu and paspalum (sown from December to February) and rye and prairie (sown late March to May) will provide cuttings of nutritious, easily-handled green food.

TABLE IV.

POULTRYMEN'S CALENDAR FOR GROWING GREEN FEED.

Month.	What to Sow.	Ready to Cut in Approximately—	For Use in—
		Weeks.	
January	Millet	3	January–February
	Buckwheat	3	January–February
	Poona Pea	4	February–March
	Kikuyu Grass ..	8	All year in frost-free areas
	Paspalum Grass ..	8	All year in frost-free areas
February	Millet	3	February–March
	Buckwheat	3	February–March
	Poona Pea	4	March–April
	Kikuyu Grass ..	8	All year in frost-free areas
	Paspalum Grass ..	8	All year in frost-free areas
March	Oats	3–4	April–May
	Barley	3–4	April–May
	Wheat	3–4	April–May
	Rape	4	April–June
	Field Peas	4	April–July
	Italian Rye Grass ..	5	May–November
	Wimmera Rye Grass	5	May–November
	Prairie Grass ..	5	May–November
	Chinese Cabbage ..	..	..
April	Oats	3–4	May–August
	Barley	3–4	May–August
	Wheat	3–4	May–August
	Rape	4	May–July
	Field Peas	4	May–July
	Lucerne	4–6	All year round
	Italian Rye Grass ..	5	May–November
	Wimmera Rye Grass	5	May–November
	Prairie Grass ..	5	May–November
	Chinese Cabbage ..	..	..

TABLE IV.—*continued.*

POULTRYMEN'S CALENDAR FOR GROWING GREEN FEED—*continued.*

Month.	What to Sow.	Ready to Cut in Approximately—	For Use in—
		Weeks	
May	Oats	3–4	June–August
	Barley	3–4	June–August
	Wheat	3–4	June–August
	Rape	4	June–August
	Field Peas	4	June–August
	Lucerne	4–6	All year round
	Italian Rye Grass ..	5	May–November
	Wimmora Rye Grass	5	May–November
	Prairie Grass ..	5	May–November
	Chinese Cabbage ..	..	..
June	Oats	3–4	July–September
	Barley	3–4	July–September
	Wheat	3–4	July–September
	Field Peas	4	July–September
	Chinese Cabbage ..	..	..
July	Oats	3–4	August–October
	Wheat	3–4	August–October
	Barley	3–4	August–October
	Field Peas	4	August–September
	Canary Seed ..	4	August–September
	Chinese Cabbage ..	..	..
August	Millet	3	August–September
	Canary Seed ..	4	September–November
September	Millet	3	September–October
	Buckwheat	3	September–October
October	Millet	3	October–November
	Buckwheat	3	October–November
November	Millet	3	November–December
	Buckwheat	3	November–December
	Poona Pea	4	December–January
December	Millet	3	December–January
	Buckwheat	3	December–January
	Poona Pea	4	January–February
	Kikuyu Grass ..	8	All year in frost-free areas
	Paspalum Grass ..	8	All year in frost-free areas

GREEN FEED SUBSTITUTES.

Lucerne Chaff.

Lucerne chaff has been found an excellent substitute for green feed. It possesses most of the qualities of good green feed, being a relatively valuable source of vitamin A and minerals and containing some vitamin D. All lucerne chaff has not the same value, and the choicest lines are the most desirable for use in the feeding of poultry. Leafy lucerne of a good green colour is a good source of vitamin A, whilst lucerne that is bleached contains virtually none. The important factor of fibre

content, together with the protein value, is illustrated in the following analyses:—

	Protein. Per cent.	Fibre. Per cent.
Choice leafy lucerne chaff ..	18 to 22 ..	25 to 28
Good lucerne chaff	16 to 20 ..	27 to 30
Poor lucerne chaff	10 to 12 ..	31 to 35

Lucerne chaff for poultry should be finely cut to obtain the maximum consumption of the quantity supplied. When grain is fed it can be incorporated in the mash to the extent of 10 per cent. If the mash is to be fed in a moist state, the lucerne should be soaked before use, the time of soaking being arranged to suit the convenience of management. The quantity of water used for soaking should be just sufficient to mix a crumbly mash. This is the most economical method of using lucerne chaff as a green feed substitute.

Silage.

The feeding of silage as a substitute for green feed has proved very satisfactory in experiments conducted in the United States of America. Queensland poultrymen who have had some experience with silage speak highly of it. Silage may be made of many kinds of green feed. Legumes would undoubtedly prove the most nutritious, but barley, oats, lawn clippings, &c., will also make good silage.

Method of Preparation.—As silage for poultry should be made from young growths which are rich in protein, molasses is added. The material to be used should be cut, while still fresh and succulent, into lengths of about half an inch. Failing concrete silos, barrels or drums of a capacity of about 40 gallons may be used. Immediately after cutting, the material should be packed tightly into the silo which should be filled to the top. To each 40-gallon drum of material 2 gallons of molasses thinned with water (usually about 2 gallons) are poured over the top. The quantity of water is largely governed by the wilting that has taken place before chaffing. A weight of about 150 lb. to 200 lb. should be applied to the top of the silage, and it should then be left to stand for some time. Considerable settling down will take place permitting of more material being added the next day, after which the weight should be again applied. After a little more settling down has taken place the silo should be sealed. This is one of the most important points in the manufacture of silage. The most satisfactory procedure to adopt is to cover the silage with tarred paper or other waterproofed covering and place over it puddled clay to a depth of 2 to 3 inches. This should be inspected after about two days and again at later intervals. Any cracks which appear on its surface or between the drum and the clay should be plastered with more clay. With properly sealed silage the material used retains its colour, the juices are conserved, and the development of moulds, grubs, and larvae is checked. The development of these would make the use of the silage dangerous.

Method of Feeding.—Though they usually take to it readily, poultry may have to be accustomed to silage. The best method of introducing it to their ration is to mix it with the mash. Once they have become accustomed to it, silage may be fed as a green feed. It will be freely consumed, but 1 to 2 quarts per 100 birds will be found sufficient.

Effects of Feeding.—The quality of the eggs produced by birds fed on silage is not affected, nor have any other effects depreciating its value as a poultry food been noted.

MILK.

There is no better animal protein-rich food for all stock than milk. Skim milk, buttermilk, and whey—the most common milk products in Queensland—are foods of great value for poultry of all ages. Milk provides easily digested proteins, in addition to lactose, minerals, and vitamins, all of which are important for development, production, and health. Where skim milk is used to mix moist mashes, increased consumption and better development of young stock and increased production from layers follows. The lactose in the milk also helps to build up resistance to disease by keeping the intestines in a healthy state.

Fresh or soured milk is equal in food value. The feeding of milk as a drink is the only method by which quantities can be consumed by the fowl. Care must be exercised to see that the vessels from which milk is fed to poultry are kept clean and putrefaction avoided. Many adopt the practice of feeding the curds only, rejecting the whey. Whey, however, also had a definite food value, and should be used. When fowls are fed milk in open vessels considerable soiling of the feathers takes place. This gives adults an objectionable appearance and seems to affect the general health of young growing chickens. Therefore, chickens should be forced to drink milk through a grid.

It is generally accepted that 1 gallon of skim milk is equal in protein value to nearly 1 lb. of meat meal. Poultry farmers generally appreciate the necessity of efficient feeding, and to give their fowls the necessary amount of protein they should use prepared mashes or prepare mashes including meat meal. These mashes are usually fed with grain, the birds being given an equal quantity of each. In these circumstances a sufficient amount of protein is made available to the birds. The farmer who has a supply of skim milk available for his fowls must depart somewhat from his ordinary practice, for skim milk is a protein-rich food; but how far he may do so depends on the quantity of the skim milk available. When fowls are supplied with skim milk to the extent of 5 gallons per 100 birds per day, no other protein-rich food of animal origin is necessary. However, if the birds are given only, say, one-half of this quantity, half the quantity of mash that is usually fed should be supplied and the grain increased by about 50 per cent.

When milk, mash, and grain are being fed to the flock it is generally a sound policy to give the birds all the grain they will consume and not force them to eat given quantities of mash. This will enable the birds to balance their own ration.

COMMERCIAL FOODS AND THEIR FEEDING VALUE.

Barley.

Barley is not a popular food among poultry-keepers and fowls do not consume it readily. It has a fair feeding value, but in order to increase its palatability it should be soaked or sprouted. When corn and wheat are high in price, barley may be used to the extent of 50 per cent. of the grain mixture, but the change over should be gradual.

Beans and Peas.

When whole, fowls do not take kindly to beans or peas; but if either is crushed it will add to the protein content of the mash, and may be used to the extent of 5 per cent.

Grain Sorghum.

In the drier areas sorghum may be grown successfully when maize or wheat is a failure. Sorghums are slightly higher in protein content than maize, and may be used in poultry rations as extensively as wheat.

Maize.

Maize is one of Queensland's staple grain crops. Poultry eat it readily. Large grain should be cracked, but the smaller varieties can be fed whole. When purchasing maize for grain feeding, it is advisable to secure the small grain. The quality is then easily judged and there is no waste. Cracked grain should always be sieved before being used, and the fine powder used in the mash. Yellow corn should be used in preference to the white because of its vitamin A content.

Oats.

In some places oats is one of the principal poultry foods, but as most of Queensland's supply is imported it cannot be used economically in large quantities. It is, however, desirable to add variety to the ration of breeding stock by using a proportion of it. It is high in fibre and unless hulled should not constitute more than 20 per cent. of a ration.

Whole Rice.

In the northern portion of Queensland where rice is grown, it may be possible to use quantities economically. It is a very starchy food of a fattening nature, but can be used to the extent of one-third of the grain ration. Crushed or ground rice should be used with care. It has a tendency to go rancid and is also high in fibre.

Wheat.

Wheat provides the bulk of our poultry food. It is readily consumed by poultry and can be fed as a part or whole of any grain ration, the market price of various grain foods available being the guide as to the quantities used. Plump wheats of a hard nature are of better feeding value than pinched grain or full soft grains.

Bran.

Bran is rich in protein and mineral matter but contains a considerable quantity of fibre. This fibre is useful in adding bulk to the ration. It also assists in making a mash when fed wet of a desirable consistency. It may be used at the rate of up to 30 per cent. of the mash.

Pollard.

Pollard has a greater proportion of carbohydrates than bran, but not so much ash and fibre. It may form the principal constituent of mashes and be used to the extent of 60 per cent of the total mash.

Ground Oats, Rolled Oats, and Hulled Oats.

Ground oats—that is, oats without the hulls—is an excellent food for both laying and growing stock. The use of these foods is largely governed by the price.

Linseed Meal.

Rich in oils and proteins, also fibre, linseed meal may be used to the extent of 2 per cent. in the laying mash and increased slightly during the moulting period. It is very bulky when wet and reduces the appetite if fed in large amounts.

Cottonseed Meal.

Cottonseed meal, on analysis, would appear to be a splendid food for poultry, but in practice its extensive use has not given good results. A good grade may be used to the extent of 5 per cent., but this quantity should never be exceeded as it spoils the keeping quality and yolk colour of the egg.

Peanut Meal.

Peanut meal is a protein-rich and easily digested food. Unless the fat content is low, the keeping quality is poor, as it is inclined to go rancid. It may be used to the extent of up to 5 per cent. in building up the protein content of a ration.

Meat Meals.

Meat meals vary considerably in their analyses. They are essential for high egg-production. When poultry are kept in closed runs where no other class of animal food is available, meat meals may be used to the extent of 10 per cent., but with stock on free range during periods when animal food in the form of insect life is plentiful, the quantity should be considerably reduced.

Dry Crushed Bone and Bone Meal.

Dry crushed bone and bone meal are essential for the development of the bony structure of young growing stock and beneficial to laying birds. Poultry-keepers who are a distance from markets may build up a supply of mineral matter suitable for young stock by burning any bones about their property. After burning the bones are easily reduced to a size to feed.

Grits.

Shell grit, limestone, or crushed bone should be provided. Plentiful supplies of oyster shell or ground lime should always be available, while bone may be supplied either in the form of meal or grit.

Hard Flinty Grit.

Hard pieces of rock, sand, &c., are necessary to enable poultry to grind their food, and should be in free supply, particularly with stock confined to pens. Without grit it is impossible for stock to digest their food thoroughly, and any system of feeding where this is not supplied is wasteful.

Salt.

Salt needs to be well mixed with the mash; when wet mash is fed it may be dissolved in the water, but when fed dry too much care cannot be exercised in thoroughly distributing it throughout the mash. Excessive quantities are poisonous.

[TO BE CONTINUED.]

The Seditester, Brisbane Type.

O. KUDELKA.

THE Sediment Test, first described in 1910 and applied with the well-known Wisconsin type of machine, has many advantages and disadvantages.

It shows the unfilterable dirt present in one pint of milk under test and permits a rough classification. A very dirty filter pad indicates a very dirty milk, but does not indicate, of course, the dissolved and filterable dirt particles which readily pass through the filter. A clean pad, therefore, does not necessarily mean a very clean milk, since outside contamination may have been caused by soluble agents. No direct conclusion is possible as to the bacterial contamination and the keeping quality of the milk. Bacteriological and chemical changes may take place without any visible change in the appearance of the milk.

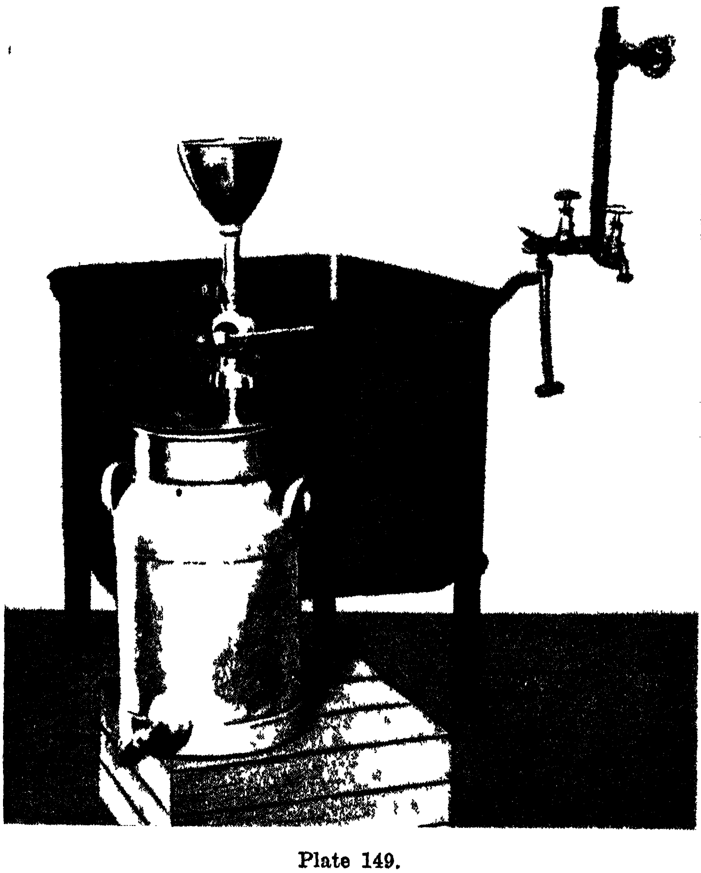
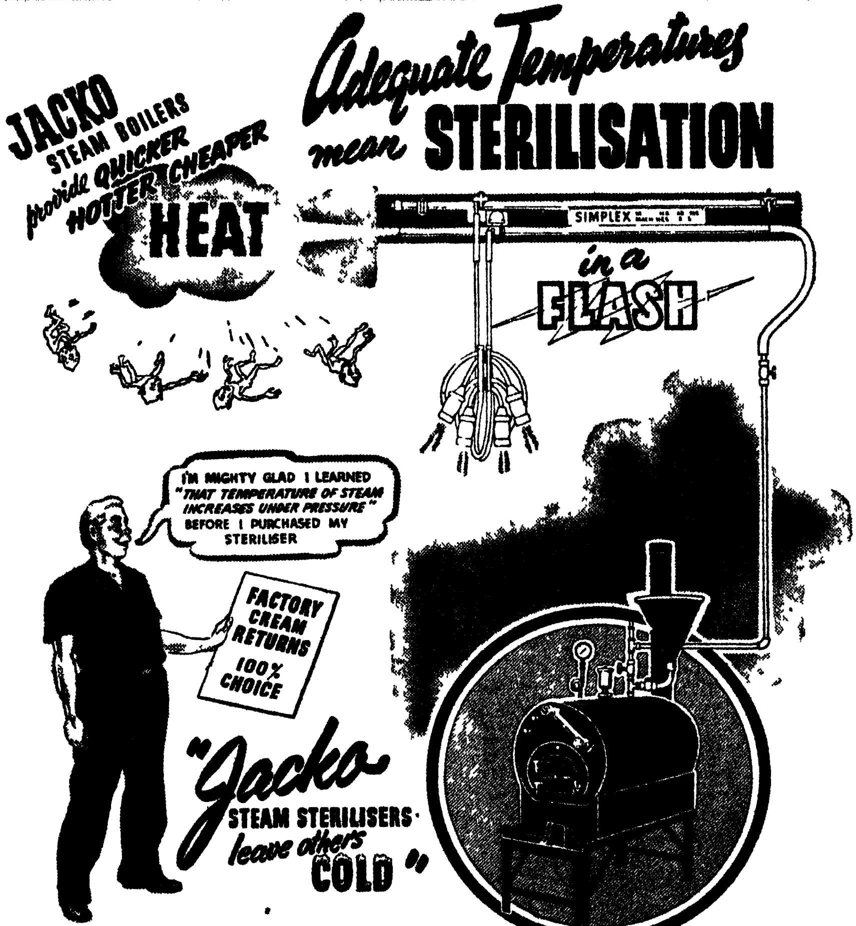


Plate 149.

SEDITESTER IN USE.—*Note*: The vat behind the seditester serves only as a receptacle for the water running from the water-jet vacuum pump.

Although it is not suitable to grade high-quality milk, the sediment test is undoubtedly useful in indicating low-quality milk, as dirt is always associated with bacterial contamination and, consequently, with the lowering of keeping quality.



To Eliminate Low Grade Cream
IS IMPERATIVE

For hygienic, convenient, and profitable production

USE

BALTIC-SIMPLEX
Dairy Farm MACHINERY

Our Past Success is Your Future Safeguard

BALTIC SIMPLEX MACHINERY CO. LTD.

Queensland Branch **179-181 MARY STREET, BRISBANE, B. 15**

The big advantages of this test are the speed and the simple equipment with which it is performed, so allowing objectionable milk to be rejected at the platform. Further more, the results of this test are easily recorded, and when communicated to the farmer they are far easier to understand and, therefore, more impressive than all other bacteriological and chemical tests.

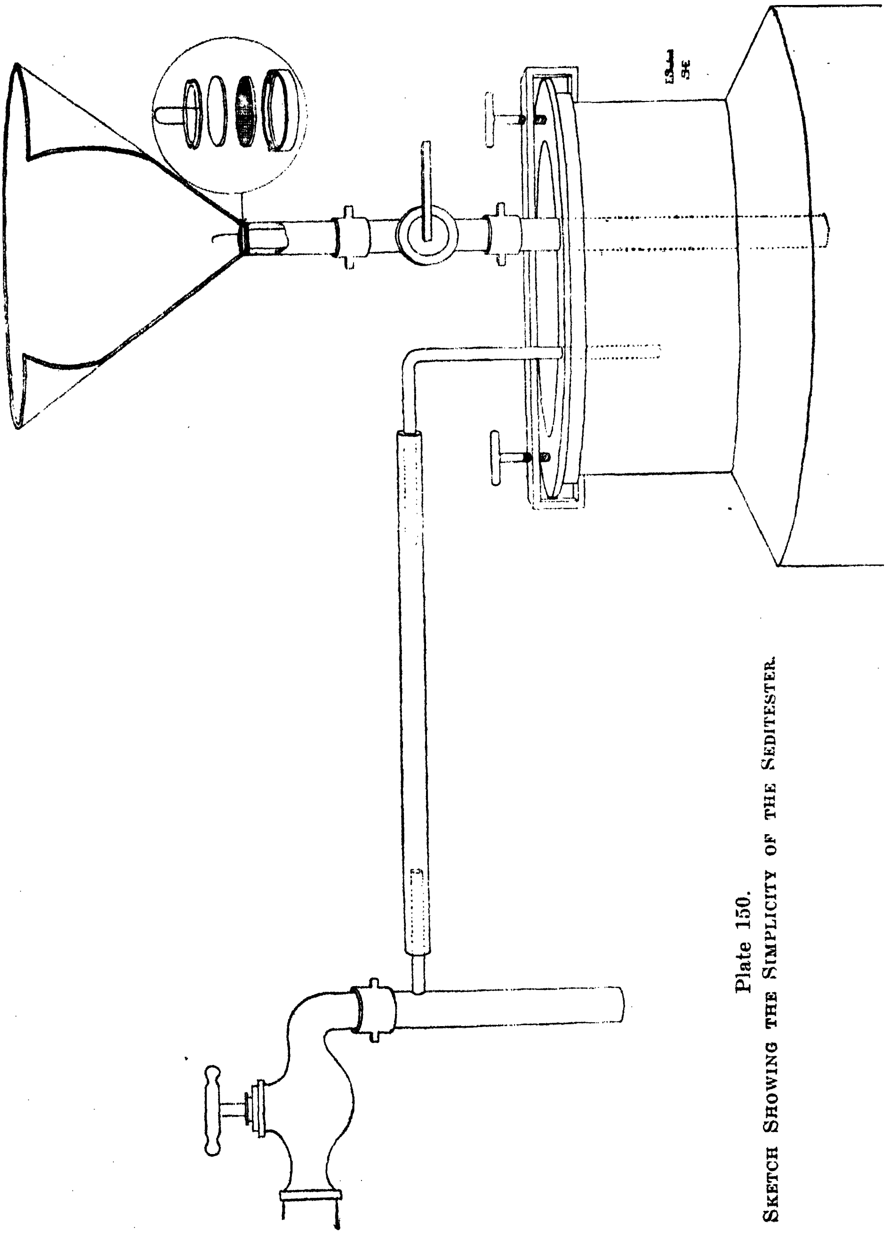


Plate 150.
SKETCH SHOWING THE SIMPLICITY OF THE SEDITESTER.

A practical setback to the more frequent use of the sediment test is that the commonly used Wisconsin type of machine (the gun) has to be opened at the top to pour in the milk and then at the bottom to

replace the filter pad, which takes time. Moreover, the milk has to be forced through by means of a blow ball, which is fairly tiring work. To carry out this test on a large number of cans without holding up the work on the milk platform, a gang of at least three men is usually necessary.

Considering the scarcity of labour and the probable necessity of employing young women for testing work, the construction of a sediment tester has been undertaken which will save work and can be handled easily by a girl.

The seditester is a simple apparatus built at small cost. The principle on which it works is a vacuum generated in a tapped 8 or 10 gallon milk can by means of a water or steam jet vacuum pump which can be attached to any pressure water supply (main water supply in towns or high tanks in country factories) or to any steam generating boiler.

The vacuum pump is connected to the can lid by a pressure rubber tubing and a tinned copper pipe (⅛ inch diameter). Mounted on the lid is a funnel (capacity 1½-2 pints) which may be fitted with double walls to contain hot water. The funnel is connected to the lid by standard 1-inch cream fittings. All the fittings have one milk union and one cock, preferably of the gland-packed type, to ensure no air leakage. The sediment pad rests inside the funnel on a perforated metal gauze, and is kept in position by a metal ring which can be fixed to the wire diaphragm. The whole filtering system (gauze, pad, and ring) is removable from the funnel as a unit, and the filter pad can be changed quickly.

The lid is fitted to the can and made air-tight with a piece of rubber ring and clamps.

The milk to be tested is sampled in a quart container. One pint is run through the seditester (which takes 6 to 8 seconds according to the milk temperature). The other pint is kept as a reserve so that a second filter pad can be obtained to send to the farmer if necessary.

The seditester as described is already in satisfactory use in one big milk depot in Brisbane, and will be in use soon in another one.

The co-operation of Mr. D. Foreman, of the Metropolitan Milk Supply (G.B.) Ltd., who built the first model according to the description, is acknowledged.

SPLICING WOVEN WIRE FENCE.

A good way to make a permanent or temporary splice in woven wire fencing is shown in the drawing. The end of each horizontal wire is looped around a

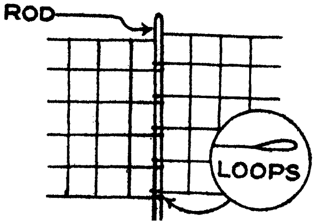


Plate 151.

½-inch, or larger, steel rod. One must be careful not to hook the opposite loops together. Whenever it is desired to take a woven wire fence apart at the splice, it is necessary only to pull out the rod.—P.B. in *The New Zealand Farmer Weekly.*

Factors Affecting the Quality of Milk for Cheese Manufacture.

W. J. PARK and V. J. BRIMBLECOMBE.

SYSTEMATIC cleanliness is the golden rule in dairy practice. The necessity for the utmost care in the production and handling of milk for cheese manufacture cannot be too strongly emphasised. A deterioration in quality is very rapid, unless hygienic principles are strictly applied. According to the extent to which milk is deteriorated during production and handling, the quality of the cheese manufactured will be lowered, for the cheesemaker cannot convert milk of low quality into satisfactory cheese.

As a milk grading test and for its educative value in assisting producers to locate and rectify faults in production, the methylene blue test should be applied regularly (say weekly) at cheese factories. The Wisconsin curd and fermentation tests are also useful for detecting the suppliers of inferior milk.

The most troublesome causes of defects and contamination in milk are:—

1. Unhealthy cows—producing abnormal milk.
2. Insanitary methods of production (Bacterial Defects).
3. Flavour tainting weeds and fodder.
4. Adulteration of milk.
5. Absorbed flavours.

1. Unhealthy Cows Producing Abnormal Milk.

The quality of milk is adversely affected by the use of milk from cows—

(*a*) *Too soon after calving* (*Colostrum milk*).—Milk from new cows should not be included with the normal milk until at least ten days after calving and sometimes longer, or until the milk is normal.

(*b*) *That have aborted.*—All aborting cows should be isolated, the milk discarded for cheesemaking, as it has a tendency to cause bitterness in cheese; and the cows affected ultimately sent to a meat works which is under supervision of a permanent Slaughtering Inspector.

(*c*) *Far advanced in lactation.*—Milk should not be used from cows less than 15 days prior to calving. It is sound practice to dry all milking cows off at least 6 weeks prior to calving.

(*d*) *Suffering from Mammitis.*—Mastitis milk is responsible for much trouble in cheese making, and should be excluded from the bulk supply. Cows suffering from Mastitis should be isolated and control measures applied. Careful dairy hygiene will assist to control this disease.

(*e*) *Affected with Three-day sickness*, or any other disease which adversely affects the normal health of the cows. Milk from such cows should not be used for manufacture of cheese.

2. Insanitary Methods of Production.

The bacterial defects such as unclean or "off" flavour, overripe, stale, fermented, yeasty, cheesy, tallowy, and gassy milk, originate in this manner—

(*a*) *Personal uncleanliness.*—The persons engaged in milk production should be clean in their personal habits, and in good bodily health, and when engaged in milking should wear clean overalls kept specially for this purpose. The milkers' hands should be washed after milking each cow. Wet hand milking should not be tolerated.

(b) *Failure to wash cows' udders and teats.*—Manure, dust, and dirt cling to the flanks, udders, and teats of the cows; and before milking, udders and teats should be washed with clean water to which has been added a chlorine preparation and wiped with a clean, dry cloth. During milking, this chlorine rinse should be changed as often as necessary. The udder cloths should be boiled daily and hung out in the sun to dry. It is a wise practice, while washing udders and teats, to milk the first three or four squirts from each teat into a vessel kept for this purpose. This first milk may be highly contaminated with undesirable organisms. Milk should be aerated and cooled and stirred. The night's milk should be placed in half-can quantities on a clean milk stand in a stock-and-dust free area and kept as cool as possible.

(c) *Dirty utensils and equipment.*—Dirty utensils are among the main sources of undesirable bacterial contamination of milk. All utensils—including strainers, buckets, coolers, cans, milking machines (more particularly the teat cup assemblies), milk lines, vacuum tank, and air lines, in fact any utensil which comes into contact with the milk—should be thoroughly cleansed and sterilized.

Dairy equipment—benches, wash-up trough, draining racks, sterilizer, or boiler—should be conveniently placed for efficient working and kept clean. All utensils and equipment should be maintained in good repair. Rusty utensils should be either retinned or dumped.

(d) *Unsatisfactory dairy buildings and surroundings.*—Dairy buildings should be kept in good repair, and the layout of yards should be so planned that milking can be done with the minimum of inconvenience and without unduly disturbing or exciting the cows.

The interior of the buildings should be limewashed or painted, and cobwebs removed periodically. The buildings should not be used as harness or store rooms.

Droppings should be removed from the yards daily to reduce manure dust to a minimum.

All milk should be placed on a convenient milk stand in a stock-and-dust-free area until delivery to the factory.

During delivery, a suitable cover to protect the milk from the sun should be provided, and early delivery should be maintained throughout the year.

(e) *Impure water supply.*—Ropy and slimy milk is chiefly caused by impure water. Drinking water for cows should be wholesome and supplied in suitably constructed troughs which can be regularly cleaned. Cattle should not be allowed to wade in swamps, dams, or water holes, and the ground around the water-troughs should not be allowed to become boggy.

Water for washing utensils and rinsing should be free from bacterial contamination. If the water is suspected of being impure, it may be treated with chlorine at the rate of half an ounce (½ oz.) of "Dairychlor" to 1,000 gallons.

Water from tanks at the milking shed becomes contaminated with manurial dust, and these tanks should be regularly cleaned, and sterilized with a chlorine preparation.

(f) *Inefficient methods of handling of milk.*—Incorrect methods of handling contribute to the deterioration of milk quality and especially to the following defects:—

(i.) *Overripe milk* caused by failure to properly aerate and cool the milk, and to keep it cool pending and during delivery; by not putting the night's milk on an approved milk stand, and so allowing the direct rays of the sun to shine on the cans of milk.

(ii.) *Dirty milk.*—This is caused by carelessness in methods of production and failure to use the cotton wool filter wad in straining. All milk for cheesemaking must be strained by wad filtering. Inefficient straining can be detected by the Sediment Test.

(iii.) *Churned milk*—free fat in the milk.—Mainly caused by failing to stir the night's milk; mixing of night's and morning's milk; by the agitation of milk over rough roads churning the fat in the milk.

3. Flavour Tainting Weeds and Fodder.

(*a*) Strong tainting weeds like carrot, mustard, hexham, stinking rodger, &c., cause an undesirable flavour in milk. These undesirable weed taints may be lessened by change of ration; allowing cows to graze on such feed immediately after milking, and taking them off some considerable time before the next milking. Cooling and thorough aeration of the milk also greatly assist in controlling weed taints.

(*b*) The feeding of strong fodders, viz., green lucerne, clover, &c., and silage and mouldy foods also causes undesirable flavours. Control measures may be adopted as stated above for weed taint.

4. Adulterated Milk.

(*a*) *Watered Milk.*—This may be detected by the use of the lactometer or by a determination of the freezing point.

The adulteration is mainly caused by deliberate watering, or by allowing flushing water from machines to flow into the milk.

The addition of impure water is detrimental to quality, and any water added lowers the yield of cheese. Watering is, moreover, an offence.

(*b*) *Skimmed Milk.*—Caused by skimming cream off the night's milk, or separation of portion of the milk and pouring the skimmed milk into the bulk supply.

Skimming may also be detected by the use of the lactometer. Skimming causes dry, hard, corky body; flat flavour; and decreases the yield of cheese.

(*c*) *Preservatised Milk.*—Chemical preservatives, viz., formalin, boric acid, salt petre, &c., are detrimental to cheesemaking. Most chemical preservatives affect the action of rennet and acidity, and increase the losses in cheesemaking.

Preservatives may be detected by various chemical tests. Milk adulterated with chemical preservative should be rejected at the Cheese Factory.

5. Absorbed Flavours.

Milk stored in an impure atmosphere or adjacent to any strong-smelling substance, will readily develop an "off" flavour by absorption of the particular smell. Contact with new or perished rubber inflations, rag strainers, untinned utensils, will taint milk, and it will readily take up disinfectant flavours if odorous disinfectants are used for washing cows' udders. Cleaners of a pungent-smelling nature should be avoided for the same reason. Exhaust fumes from engines and anything of an oily or kerosene nature will readily be absorbed by milk and cream, giving undesirable flavours.

A Domestic Solar Water-heating System.*

By G. BATES.

Design and Construction.

THE idea of utilizing the radiant energy of the sun as a means of heating water is by no means new, but it appears never to have been developed in Australia, in spite of eminently suitable conditions. An article written by Dr. H. W. Kerr, and published in the "Cane Growers' Quarterly Bulletin" for April, 1936, inspired the writer to construct a domestic unit with the object of testing it under North Queensland conditions. The results have been gratifying, and the following particulars regarding the construction and lay-out of the system are furnished in the hope that others will be encouraged to adopt this simple and cheap method of heating supplies of water for domestic and other purposes. It is appreciated that there are a number of points where experience has shown that this particular installation could be improved, but on the whole it is quite efficient and supplies all the hot water needed for the home.

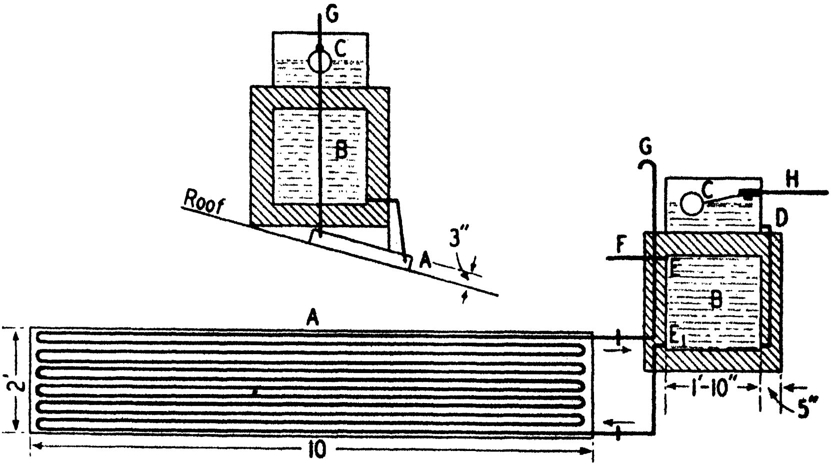


Plate 152.

ILLUSTRATING THE DESIGN OF THE SOLAR WATER-HEATING SYSTEM.

A.—Absorption chamber.
B.—Storage tank.
C.—Supply tank with ball valve.
D.—Connection from supply tank to storage tank, ¾ in.
E, E_1.—Connections from storage tank to heating coil, ¾ in.
F.—Connection to domestic supply pipe, ½ in.
G.—Vent pipe, ½ in.
H.—Connection to main water supply, ½ in.

The unit consists of two distinct parts, the *absorber* and the *storage tank*. The working of the system depends upon the ability of a black surface to absorb heat when exposed to the sun, and the fact that convection currents can be used to bring about continuous circulation of heated liquids. The absorber is composed of a bank of pipes or "flat" coil of

* Paper presented at the Cairns Conference of the Q.S.S.C.T., 1941. Adapted by permission of the Society for publication in *The Cane Growers' Quarterly Bulletin* for July, 1941, and reprinted from the *Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock).

¾-inch iron water piping, set on a sheet of galvanised iron within a shallow box, and protected from the cooling action of wind by a glass cover. The coil contains twelve lengths of piping each 9 feet 3 inches long, joined together by low pressure return bends (Plate 152). This length of pipe was selected mainly because it was obtained by cutting standard lengths of water-piping in halves, thus reducing the labour required to make the coil. To increase heat absorption, the coil and galvanised iron were painted black after setting in the shallow box. The dimensions of the box in this installation are 10 feet by 2 feet, giving a heat absorbing surface of 20 square feet. The upper part of the coil is connected directly to an insulated storage tank, while a feed pipe leads from the base of the storage tank to the lower portion of the coil; the base of the absorber is set somewhat lower than the bottom of the storage tank. The storage tank is made from plain galvanised iron and is insulated by a layer of sawdust of 5 inches minimum thickness; the use of a copper tank would be a distinct improvement.

The maximum amount of heat is absorbed when the rays of the sun strike the absorber at an angle of 90 degrees, but, of course, this angle could not be maintained throughout the whole day unless the absorber were mounted on gimbals and mechanically rotated. In practice, it is found sufficient to expose the absorber on a northerly slope of the house roof at an angle of some 15 degrees from the horizontal.

The operation of the system can best be explained by reference to the diagram (Plate 152). On exposure to the sun, water in the coil A becomes heated and rises by convection and flows slowly upwards, eventually entering the storage tank at its highest point, E. The warm water thus removed from the coil is continuously replaced by cooler water from the base of the tank through the outlet (E_1). There is thus a continuous circulation of water while the sun is shining, the temperature of the water in the storage tank gradually increasing throughout the period of sunlight. The household requirements are drawn from the topmost layer of water in the tank (this being the hottest zone) through the ½-inch pipe, F. The supply in the tank is then replenished from the base through the intake pipe, D, this flow being controlled by a ball valve operating in an overhead 6-gallon supply tank, C, connected with the service supply pipe, H. In order to minimise losses by radiation and maintain supplies of hot water overnight, good insulation of the storage tank is an obvious essential.

It has been determined in the United States of America that a minimum average of six hours' sunlight per day is necessary for the successful operation of a solar heater; under such conditions, 1 square foot of heating surface (i.e., the coil and the metal to which it is clamped) will heat 1 gallon of water per day to approximately 150 degrees F., the temperature rising with increasing hours of sunlight. The storage tank should be of ample capacity, and in a domestic installation it is a good rule to allow a daily average of about 15 gallons per member of the household, although this quantity can be reduced in warmer climates.

In the installation under consideration the capacity of the storage tank is slightly less than 40 gallons, while the area of the absorber is only 20 square feet, or half the generally recommended ratio. Against this, however, is the fact that the intake temperature of the water is comparatively high.

The cost of this installation, purchasing materials at retail rates in Cairns, and having the storage and supply tanks made by a local plumber, amounted to a little more than £10. The assembly and general construction were carried out by the writer and a friend, and, once the design was worked out, the time required was not great.

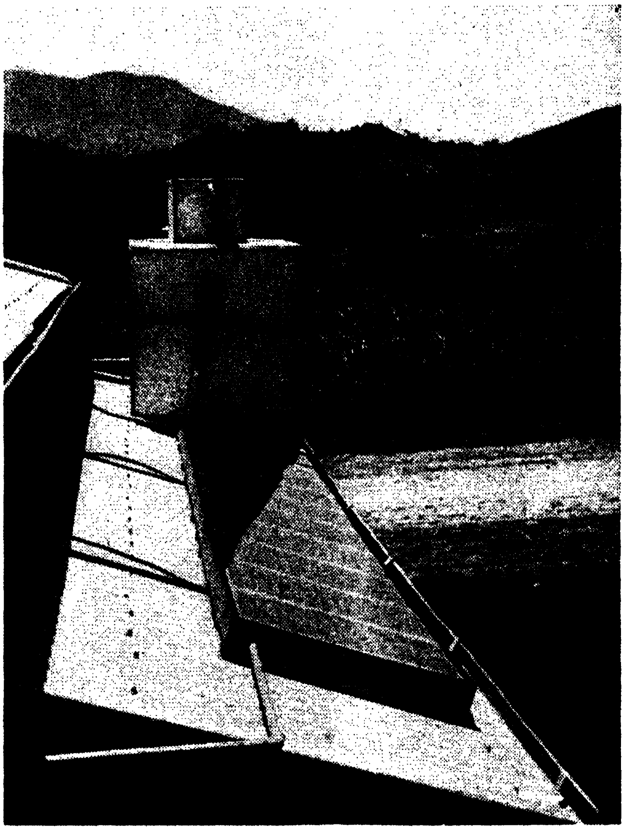


Plate 153.
ILLUSTRATING THE SOLAR WATER-HEATING SYSTEM.

Discussion.

Points Requiring Adjustment.—In an actual test, it was found that the unit was capable of heating 20 gallons of water from 95 degrees to 121 degrees on a bright, clear day in December. By some attention to the following points, it is felt that the efficiency of the unit could be greatly improved.

1. At present the tap over the kitchen sink is connected to the storage tank by 28 feet 6 inches of ordinary ½-inch uninsulated water piping. The substitution of lightly insulated ⅜-inch copper piping would eliminate much of the heat loss in transmission; moreover, in most cases it will be possible to place the storage tank much nearer the kitchen—where water is most frequently drawn. Uninsulated iron piping is also used in servicing the bathroom and wash basin.

2. Both the storage tank and the absorber rest on the roof, and, after 3 p.m., the tank, being on the western end, begins to shade the absorber. The best position for the storage tank is above the house ceiling, under cover of the roof.

3. The insulation of the absorber box is quite inadequate; the galvanised iron base rests on the galvanised iron roof, instead of being supported on an insulated floor, while, at the time of the above recorded tests, the panes of glass were laid loosely on the top of the box, instead of being sealed in. It is obvious that much valuable heat would be lost by these defects.

It has been stated earlier that the unit is operating in a manner satisfactory for our purposes, and this is no doubt due to the fact that the capacity of the storage tank is much greater than actual requirements. Nevertheless, it is obvious that with the provision of the recommended proportion of absorber surface (i.e., 1 square foot per gallon of tank storage), and the elimination of the abovementioned defects, it would be very easy to get a daily supply of 40 gallons of hot water at a temperature in excess of 150 degrees F.

Suitability for North Queensland Conditions.—We have pointed out that a minimum of six hours' sunlight per day is necessary for the efficient working of solar heaters, and thus Queensland should be almost an ideal place for their installation. Actually, some heat is absorbed even on cloudy days, but it must be expected that there will be times in the wet season when very little heating will take place. In order to investigate this point, the weather records compiled over the past four years at our Meringa Station were carefully examined. For the purposes of comparison and using 10 per cent. groupings, days with 0 to 30 per cent. of cloud were taken to be clear days; 40 to 70 per cent., to be partly clouded; and 80 to 100 per cent., clouded. On the basis of this assumption, the average number of days in each category for the four years 1937-1940 was as follows:—

Month.	Clouded.	Part Clouded.	Clear.	Average Max. Temp. °F.
January ..	12·5	6·5	12·0	91·7
February ..	11·5	6·0	10·5	90·8
March ..	12·0	6·0	13·0	89·1
April ..	9·0	7·5	13·5	86·4
May ..	9·5	9·5	12·0	84·0
June ..	10·5	7·0	12·5	81·0
July ..	11·5	7·5	12·0	78·4
August ..	8·5	4·5	18·0	81·2
September ..	6·0	6·0	18·0	85·0
October ..	7·0	7·0	17·0	88·3
November ..	8·5	6·5	15·0	91·2
December ..	3·0	7·5	20·5	92·6
Total ..	109·5	81·5	174·0	

From this, it is computed that on approximately 110 days per year, a solar heater in North Queensland would operate at materially reduced or low efficiency. On the other hand, with a suitably sized storage tank and adequate insulation, there is some carry-over of hot water from day

to day, so that a single day's cloudy weather would not seriously interfere with the operation of the system.

The records were then further searched to determine the number of days beyond the first, which were included in two-day or longer cloudy periods. The average number of such days was as follows:—

January	8·25
February	7·25
March	11·0
April	5·5
May	3·0
June	4·25
July	6·25
August	3·5
September	2·25
October	1·75
November	4·25
December	1·0
Total	58·25

That is to say, on the basis of low efficiency on cloudy days, and lack of carry over of hot water beyond the first cloudy day, on the average, hot water would not be available on some sixty days of the year, and on these occasions would have to be obtained from the supplementary source, whatever it might be, which had been operated in the past. On the other hand, residents of North Queensland could rely upon a free supply of hot water from a solar heater system for some 300 days of the year.

This period of constant hot water service would naturally be increased in areas west and south, where the proportion of cloudy weather is much less. Even in the north it could be further increased by the installation of a larger unit and provision for greater carry-over.

Refinements in Design of Solar Heaters.

The solar heater has been extensively developed in the United States, and particularly in California, where the ratio of cloud is low, and temperatures are mild in winter. It is used for heating water for hotels, apartment houses, industrial processes, for use in dairies, and for domestic purposes; in Hawaii, the system is widely used on the sugar cane plantations. Such installations naturally require the operation of very efficient units.

W. M. Farral, of the University of California (Bulletin No. 469, June, 1929), has carried out a thorough investigation of the principles of solar heater design and operation, and has found very considerable variation in the efficiency of different types. Contrasting black versus white absorbers, he found that, over a given period of exposure to sunlight, the standard black painted absorber raised the temperature of the water some 16 degrees F. more than did the white painted absorber.

In order to increase the heating surface of the absorber beyond that of the surface area of the actual pipes, it is usual to clamp the coil to

a metal plate (both being painted black), but better contact (and hence better heat conduction) between the pipes and the remainder of the absorbent surfaces is obtained by the affixing of metal fins to the pipes. A less expensive but efficient practice is to embed the coil partially in a thin layer of concrete, which forms a very efficient absorbing and conducting medium.

The value of the greater heating surface, such as is obtained by embedding the coil in a concrete bed, and of the use of glass to reduce the cooling effects, is demonstrated by data submitted by Farral, as under:—

Type of Absorber.	Temperature Increase in Water, °F.
Simple absorber, uncovered	9·6
Simple absorber, glass covered	15·7
Coil embedded in concrete, uncovered	15·5
Coil embedded in concrete, glass covered	19·0

By the use of a double layer of glass, re-radiation of absorbed heat may be reduced to a minimum and the heating capacity of the heater correspondingly increased; insulation of the absorber is also of great importance in the achievement of best results. Farral, working with an absorber insulated with 3 inches of cork board, has obtained air temperatures as high as 230 degrees F. beneath a single layer of glass, and 280 degrees F. beneath a double layer of glass.

Conclusion.

The solar heater method of heating large quantities of water is obviously well adapted for exploitation under the bright sunshine characteristic of Australia, and particularly of Queensland. It is, therefore, astonishing to find that the principle has never been adopted here. Enough has been said to demonstrate that the monetary outlay required for the installation of a domestic solar heating system is within the means of every householder; that the unit may be built by any enthusiastic amateur; and that a satisfactory hot water supply is assured even in the most cloudy part of the State. In a properly constructed unit the first outlay is the only outlay, and thereafter, year after year, the supply of hot water is available—convenient, abundant, continuous, and *free.*

A STACK PROTECTOR.

A good way to prevent stack tops from blowing off during a heavy wind is to make pull-proof pins from laths or slats. Saw a point on one end of the batten and cut two notches in each edge. Nail a short piece across the top and the pin

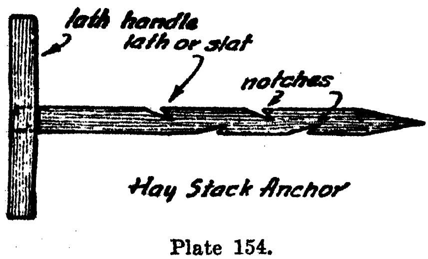


Plate 154.

is ready to be driven into the haystack. Placed at a distance of about 4 feet apart, the stack top should weather any breeze.—*The New Zealand Farmer Weekly.*

Corkwood, A Source of an Essential Drug.

A. D. PHILLIPS.

DUBOISIA,* a common Queensland plant which has lately acquired a new wartime significance, is one of the richest known sources of the alkaloid hyoscine, a powerful sedative agent which is almost a specific for treatment of certain mental disorders.

The small peace-time demand for hyoscine was easily satisfied by supplies from Central Europe and the Mediterranean countries, but war has cut off many of these sources of supply and at the same time enormously increased the demand. This has focussed attention on other sources of supply and the long-known fact that *Duboisia myoporoides* contains fair amounts of the alkaloid has brought it to the fore in this connection.

Dr. Joseph Bancroft is credited with the discovery of its value as a source of hyoscine. It is said that his attention was first drawn to the fact by reason of his daughter getting some of the green plant material in her eye. In common with several other plants of the natural order *Solanaceae* (to which *Duboisia* belongs), such as *Belladonna*, *Hyoscyamus*, *Stramonium*, &c., it possesses the property of causing dilation of the pupil of the eye. It was this phenomenon which caught Dr. Bancroft's notice and directed his attention to its medicinal properties.

The tree itself, which is somewhat shrub-like, does not, as a rule, attain any great height, average specimens reaching 10 to 15 feet. It is found right along the coastal belt of Queensland and Northern New South Wales. The trunk and major limbs are covered with a close-knit bark which varies somewhat in colour from a light-grey to a light-brown, the younger growth and twigs being of a somewhat darker shade of brown.

The foliage is on the whole sparse. The leaves themselves (see sketch) are dark-green in colour and succulent. They are greatest in breadth towards the apex, which is fairly blunt, and taper back towards the leaf stalk. The midrib is well defined and marked by a line on the upper surface of the leaf. The margin of the leaf is often slightly indented as shown in sketch. During the summer months the tree bears small ivory white flowers each of which is later superseded by a black berry. The calyx of the original flower does not fall as a rule, but persists at the back of the berry.

As a result of the present great demand for hyoscine in England it is now being extracted from *Duboisia* leaves in Australia and sent there. Difficulty in obtaining regular supplies of leaf is, however, curtailing the amount produced, and it is urgently desired to obtain more, if possible.

A word of warning should be sounded on one or two matters in connection with this plant. Hyoscine is a powerful poison and its ingestion into the human system in the very smallest quantities may give rise to serious effects. It therefore behoves anyone handling *Duboisia* leaves to take care lest any plant material enters the eyes, mouth, or nose, or comes into contact with broken skin, or tender parts of the body.

* *Duboisia myoporoides.*

Plate 155.

DUBOISIA MYOPOROIDES, R. BR.—The "Cork Wood" or "Duboisia." A. Flower. B. Flower dissected, showing 4 stamens; a fifth is aborted. C. Calyx and Pistil. D. Fruit. E. Seed.

It should also be borne in mind that *Duboisia myoporoides* should not be confused with *Duboisia Hopwoodii,* commonly known as "pituri." This latter occurs more in the western areas of Queensland and is useless as a source of hyoscine.

Plate 156.

The Government Botanist, Mr. C. T. White, to whom I am indebted for assistance in compiling this note, points out that another tree, commonly known as "corkwood" in Queensland, is *Erythrina vespertilio.* This has large red or salmon coloured flowers, whereas the flowers of *Duboisia myoporoides* are small and white. The limbs, especially the smaller ones, are armed with sharp, strong, conical prickles, which are absent from *Duboisia. Erythrina* has no value at the present time.

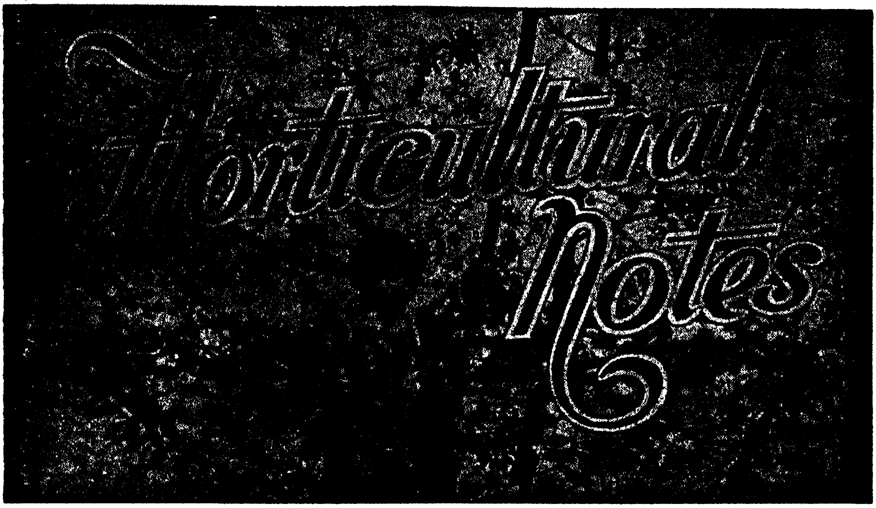


Fig Cultivation.

FIGS for use as fresh fruit grow well in Queensland, both in coastal and tableland districts. The soils most suited to their culture are good sandy loams and medium loamy soils provided with good drainage. Very severe frosts will kill the young wood unless properly matured.

Propagation.

Propagation in this State is by means of cuttings selected from matured wood of the season's growth. Cuttings should be selected during July or August and be about a foot in length, with a bud just above the cut at the base end. When planting in nursery rows allow only one or at most two eyes to remain above the ground. The following winter they may be transplanted to the orchard, being set out at a distance of about 25 feet apart each way.

Varieties.

There are many varieties of figs in different parts of the world, some are valuable for drying, whilst others are only of use as fresh fruit. Those chiefly grown in this State are White Adriatic, Brown Turkey, Purple Genoa, and White Genoa. These all set fruit without pollination.

True Smyrna figs are best for drying, but the fruit will not set without fertilization by the Blastophaga wasp from the Capri fig.

The fig fruit appears to grow direct from the tree without flowering; actually each fig is the fruit of hundreds of flowers which form inside the fig itself. For this reason it has been aptly termed the "inside out fruit." The only access to these flowers is through a small eye or opening at the apex of the fruit, and for that reason ordinary pollenising agents such as bees cannot reach them. The tiny Blastophaga wasp, a native of Asia Minor, is necessary for pollination; this insect does not exist in Queensland, and it is on this account that some varieties of figs growing here drop their fruit before it matures. The varieties mentioned above and some others will form fruit without pollination by the fig wasp, and thus are very suitable for growth in this State.

Pruning.

Pruning is a simple matter. As a general rule it is not advisable to prune heavily. After planting-out the tree is cut back to about 18 inches in height, and three or four evenly spaced branches allowed to develop. These branches usually throw out secondary branches as well as laterals so that the tree naturally grows into a good shape. Any laterals which crowd the centre of the tree may be cut right out. Once a fig tree is given its proper shape the less it is cut about the better. If the growth is too thick the young wood may be thinned out where several branches start together from the same limb. Thus, in heavy-growing fig trees such as the White Adriatic the young bearing wood should be at least 2 feet long without side branches. All other twigs may be cut off close to the main branch, though they should never be just cut back leaving a stump. Always cut them off close to the mother branch. The latter will then bear better and larger figs. The pruning of the fig when grown in the open should be confined to three or four distinct points:—(*a*) The sterile twigs found at the base of the main branches should be cut off each year. These twigs are generally bent downward, are slender, and seldom bear fruit. (*b*) Larger as well as smaller branches which cross one another should be so cut out that no further interference is possible. (*c*) Lower branches too close to the ground should also be cut off close to the main stem or main branches; and (*d*) if a tree is unevenly balanced, the branches on the larger side should be cut back in order to properly balance the tree.

Pruning is best done when the leaves have fallen and the fig tree is most dormant. Some sap will always flow, so the more dormant the tree the better.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

As these notes are being written in Sydney, their main interest will be from the standpoint of those shipping south. Examination of various Queensland fruits reveal the following.

Bananas.—Some poor lines of angular fruit are coming to the market and are hard to sell. Some growers branding the grade sixes as sevens.

Pineapples:—Some fine lines are on view, although many are spoiled by not being cut. Yeasty Rot has made its appearance in some consignments.

Tomatoes:—A more careful selection of fruit for A grade packs would have returned many growers 1s. to 3s. more per case. The very high prices prevailing have influenced many growers into believing that they have done well. The price range on one occasion of 3s. 6d. to 24s. per case speaks for itself, particularly when fruit 12s. to 24s. was easier to sell than that of lower price.

The main trouble on the market is still not an over-production, but an over-marketing of low-grade fruit.

Prices during the last week of October were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Sixes, 6s. to 8s. 6d.; Sevens, 7s. to 10s. 6d.; Eights and Nines, 8s. to 14s.

Sydney.—Cavendish: Sixes, 8s. to 10s.; Sevens, 10s. to 13s.; Eights and Nines, 13s. to 16s. Specials in each grade higher.

Melbourne.—Cavendish: Sixes, 7s. to 9s.; Sevens, 9s. to 11s.; Eights and Nines, 10s. to 13s.

Adelaide.—Cavendish: Sixes, 10s. to 13s.; Sevens and Eights, 12s. to 15s.

Brisbane.—Lady Fingers, 3d. to 9d dozen.

Pineapples.

Brisbane.—Smooths, 4s. 6d. to 8s. per case; 2s. to 6s. 6d. dozen. Roughs, 8s. to 10s. per case; 1s. to 6s. per dozen.

Sydney.—7s. to 12s. Some Yeasty Rot showing.

Melbourne.—8s. to 13s. case.

Adelaide.—14s. to 16s.

Newcastle.—9s. to 11s.

Papaws.

Sydney.—7s. to 15s. tropical case. Northern growers would do well to send less advanced in colour.

Melbourne.—8s. to 10s. Green fruit hard to sell.

Newcastle.—8s. to 10s. tropical case.

CITRUS FRUITS.

Oranges.

Brisbane.—Local Commons, 5s. to 9s. case; Imported, 5s. to 11s.

Lemons.

Brisbane.—6s. to 10s. bushel.

OTHER FRUITS.

Avocado.

Brisbane.—7s. to 9s.

Sydney.—12s. to 16s. half bushel.

Strawberries.

Sydney.—Strawberries have now disappeared from the market.

Passion Fruit.

Brisbane.—Firsts, 14s. to 18s.; Seconds, 8s. to 12s. half bushel.

Sydney.—12s. to 20s. half bushel.

Tomatoes.

Brisbane.—South Queensland: Coloured, Choice, 8s. to 12s.; Smalls, 3s. to 6s.; Ripe, 4s. to 9s. per half bushel; Green 6s. to 12s.; Bowen, 3s. to 7s.; Yarwun, 3s. to 8s.

Sydney.—South Queensland: Redlands Coloured, 10s. to 15s.; Green, 8s. to 13s.; Smalls (hard of sale), 3s. to 7s.; Bowen, 5s. to 10s.

VEGETABLES.

(Brisbane prices only, unless otherwise stated.)

Beans.—Brisbane, 2s. to 6s. bag; Sydney: Queensland beans, 5s. to 6s. bushel. Slow of sale owing to large stocks locals.

Peas.—Local and Stanthorpe, 9s. to 12s.; Inferior lower.

Cabbage.—3s. to 6s. dozen; Inferior lower.

Carrots.—4d. to 2s. bundle; Sydney, 20s. to 42s. cwt.

Beetroot.—3d. to 9d. bundle.

English Potatoes.—Old, 2s. 6d. to 5s.; New, 3s. to 8s.

Sweet Potatoes.— 2s. 6d. to 3s. 6d. sugar bag.

Cucumbers.—Locals, 5s. to 9s. bushel; Northern, 4s. to 8s. bushel; Sydney, South Queensland, 10s. to 15s.; Bowen, 4s. to 8s.

Rhubarb.—6d. to 1s. bundle.

Celery.—Local, 6d. to 1s. 6d. bundle.

Marrows.—Sydney, 6s. to 9s.; Melbourne, 10s. to 12s. tropical case.

List of Registered and Rejected Stallions.

REGISTERED STALLIONS.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under *"The Stallions Registration Acts, 1923 to 1940,"* during the year 1941-42:—

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1941–42.

Name.	No.	Age.	Colour.	Owner.
A.B.	2788	Aged	Black	F. J. Armstrong, Pilton road, Clifton
A.D.S.	2803	Aged	Chestnut	R. Dennis, Beenboona, Clermont
Air Cadet	2804	5	Chestnut	C. A. Heaton, Glenmore, Clermont
Alistar	2844	Aged	Brown	E. J. Payne, Le Lante, Chinchilla
Anarivo	2877	5	Bay	M. Ryan, Bayview terrace, Eagle Junction
Auburn Edge	2878	5	Bay	W. Mumford, Rocklea
Avelon	2805	Aged	Bay	G. B. Travers, Yarral, Springsure
Bargara	2879	5	Bay	Mrs. E. Campbell, Wonbah, Mount Perry
Black Gauntlet	2806	Aged	Black	A. M. L. and F. Co., Retro, Clermont
Calm Simon	2845	5	Bay	J. Kennedy, Kumbia
Calvous	2846	Aged	Chestnut	J. Leahy, Vale View, Kinbombi
Canning Gold	2789	5	Chestnut	T. J. Carey, Junabee road, Warwick
Chris Beauford	2790	Aged	Chestnut	F. T. Fischer, Killarney
Corio	2880	5	Bay	L. J. Driscoll, Eagle terrace, Sandgate
Crystal Brook	2791	Aged	Chestnut	T. Cowley, Ellinthorp
Dainty Revenue	2881	5	Chestnut	W. Reynolds, Winchester street, Hamilton
Dammann	2882	Aged	Bay	L. Nicholls, Long avenue, Hendra
Dandy	2778	5	Bay	H. G. Wood, Kupunn
Double D.	2807	6	Brown	J. S. McCormack, Diamond Downs, Clermont
Dusty Fox	2792	Aged	Brown	W. H. Treweeke and Sons, Umbercollie, Goondiwindi
Flametto	2808	Aged	Brown	E. A. White, Keilambete, Ruby Vale
Flying Cloud	2847	Aged	Bay	T. A. Bellotti, Ashfield Farm, Murgon
Fordite	2809	Aged	Brown	N. Flohr, Sandy Creek, Clermont
Gamin	2883	Aged	Bay	G. Reinke, Rosewood
Glen King	2810	6	Bay or brown	A. Shannon, Saltbush Park, St. Lawrence
Golden Corn	2812	5	Chestnut	A. Shannon, Saltbush Park, St. Lawrence
Gold Yet	2813	5	Chestnut	H. P. Bailey, Ulmara, New South Wales
Gordon	2814	Aged	Brown	W. J. Miller, Anmore, Clermont
Hebray	2815	6	Bay	W. H. Schnitzerling, Alpha
Heroic's Double	2779	6	Chestnut	C. R. Crowther, Cambooya
High Bachelor	2764	6	Bay	A. S. Burchmann, Lockrose, Forest Hill
High Rank	2884	5	Bay	T. M. Ahern, Gresham Hotel, Brisbane
Kialla Valley	2885	Aged	Bay	L. and A. Edwards, Palm street, Hendra
Laird	2816	Aged	Brown	W. P. Hamon, Clifton, Ubobo
Leading Lad	2817	5	Bay	C. A. Barnard, Coomooboolaroo, Duaringa
Maxson	2818	Aged	Brown	W. C. C. Hansen, Redrock, Clermont
Mr. Standfast	2868	Aged	Bay	T. Jennings, Greenmount
My Don	2793	Aged	Brown	J. Crockett, Willowvale, Warwick
My Toy	2886	5	Chestnut	G. Miller, Chamber's Flat
Pantius	2889	5	Bay	J. C. Webb, Manson road, Hendra
Peppen Dyne	2890	5	Brown	J. C. Webb, Manson road, Hendra
Rahmond	2795	Aged	Bay	R. R. Allen, Campbell's Plains, Warwick
Raingard	2819	6	Bay	W. Roberts, Rooken Glen, Bogantungan
Rayard	2820	5	Black	E. Adams, Edungalba
Rexmont	2848	5	Bay or brown	R. S. Browne, Brooklands
Rocket	2796	5	Grey	H. Wagland, Wonga, Goomburra
Roi Dennis	2821	6	Bay	A. Symons, William street, Rockhampton
Roman Prince	2871	5	Bay	J. Y. Shannon, Rodney Downs, Ilfracombe
Royal Boy	2765	5	Brown	D. J. Mallon, Ingoldsby
Roymond	2870	6	Bay	A. Bell, Caboolture
Sarcallem	2822	5	Grey	Jim White, Kunwarara
Sarlou	2823	Aged	Grey	C. A. Becker, Theodore
Scapularis	2887	6	Bay	L. J. Williams, care of L. G. Lowe, Bridge street, Albion
Seascape Boy	2872	Aged	Bay	S. Manning, Aspley
Sir Neville	2824	5	Brown	P. J. Hanrahan, Gogango
Some Fire	2849	6	Brown	H. J. Pownall, Mundubbera
Spear Measure	2891	5	Bay	E. Bailey, Nindigully
Spear Vale	2892	5	Bay	W. Tucker, Bowley street, Hendra
Steel Coat	2825	5	Brown	H. A. McCartney, Donside, Canoona
Sydney	2893	Aged	Chestnut	R. Beak, Wilangi, Wumalgi
The Vision	2826	Aged	Chestnut	C.Q.M.E. Co., Avon Downs, Clermont
Thracian	2869	Aged	Chestnut	A. Strong, Lismore
Tola Speech	2827	5	Bay	F. M. Madden, Yaamba
Top Scholar	2797	Aged	Chestnut	E. McKenna, Mill Hill, Warwick
Torpedo	2780	6	Brown	J. C. Clark, A.M.P. Chambers, Brisbane

PONY STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1941-42.

Name.	No.	Age.	Colour.	Owner.
Abdulla	2828	5	Bay	P. Smallcombe, Bororen
Aladdin's Son	2850	5	Grey	L. C. Walker, Bingera, Bundaberg
Bagdad	2894	5	Bay	A. Humphrey, Jimboomba
Black Prince	2766	5	Black	J. C. Davey, Abbeystead, Gatton
Boonah Joy	2767	5	Taffy	W. Coyne, Grandchester
Bright Gay Lad	2768	5	Bay	F. Huth, Haigslea
Cabulcha Quicksilver	2769	5	Bay	J. M. Newman, Caboolture
Cannon Lad	2895	5	Bay	Mrs. K. Cox, 4th Avenue, Sandgate
Don	2781	5	Bay	J. C. Naumann, Rosevale
Golden Primus	2798	6	Chestnut	W. B. Backhouse, Back Plains
Harir's Image	2851	5	Bay	J. R. Perrett, Mount Hope, Kingaroy
Joker	2770	Aged	Chestnut	K. Clarke, Stony Creek, Woodford
Mercurial Star	2771	5	Grey	S. J. Schofield, Woodford
Night Shade	2852	6	Grey	J. T. S. Seller, Durong, *via* Proston
Peter	2896	Aged	Chestnut	J. Volck, Kuraby
Phantom	2829	6	Grey	W. P. Hamon, Clifton, Ubobo
Playboy	2782	5	Piebald	Miss J. E. Taylor, Kulpi
Prince Carda	2830	Aged	Bay	C. H. Hammond, Ubobo
Storm	2783	5	Piebald	J. E. Gamble, Biddeston
Talafa	2831	Aged	Bay	Mrs. A. M. Burns, Talafa, Gindie
The Shah	2873	6	Grey	W. E. Webster, Sarum, Kingaroy
Tommy Boy	2853	6	Grey	S. M. Edwards, South Side, Gympie
Walker's Pride	2772	5	Brown	Mrs. E. C. Hayes, Harrisville
Young Cygnet	2799	5	Bay	P. H. Elks, Reeve's Gully, Stanthorpe

TROTTER STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1941-42.

Benowa Derby	2854	6	Bay	F. Tucker, Ellesmere, Kingaroy
Broad Wilks	2855	6	Chestnut	T. J. Burns, Mannuem, Kingaroy
Edward Harem	2097	5	Black	G. O. G. Kriedemann, Upper Coomera
Joker's Pride	2856	5	Bay	W. H. Meyers, Tiaro
Louis Belmont	2876	5	Chestnut	R. H. Wilson, Aratula
Stormalong	2898	6	Brown	J. Cockcroft, Aspley

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1941-42.

Banker	2857	Aged	Bay	W. Taylor, Barambah Creek, Gayndah
Captain	2832	5	Bay	C. Ambrose, Marmor
Captain Keynote	2833	Aged	Bay	Fitzroy Estates, Jellinbah, Blackwater
Captain Lustre	2858	6	Bay	J. T. Collett, Pomona
Captain Starlight	2773	5	Bay	C. Brown, Linville
Charley	2899	Aged	Bay	E. Geissmann, North Tamborine
Claude	2834	Aged	Bay	B. B. Marshall, Springsure
Dapple	2835	6	Grey	J. Peckett, Pines, Springsure
Dignity Lad	2784	5	Bay	J. H. L. Von Pein and Son, Pittsworth
Don	2859	6	Bay	J. A. Bawden, Moolboolaman
Donald	2836	6	Bay	A. Wienholt, Marmadilla, Springsure
Duke	2860	6	Grey	C. Carlson, Kandanga
Gay Boy	2837	5	Bay	Chalk and Son, Clermont
Gay Boy	2838	5	Bay	W. L. Pownall, Leichhardt Downs, Clermont
Ideal Tim	2861	6	Bay	W. E. Sauer, Gayndah
Irton Pride	2862	5	Bay	E. J. Keys, Proston
King Donald	2800	5	Bay	N. A. Pollock, Araluen, Goondiwindi
Kircaldy Journalist	2863	5	Roan	R. Ewart, Barambah road, Nanango
Kirkcaldy Preference	2774	5	Bay roan	W. Profke, Glamorgan Vale
Lofty	2839	6	Bay	C. H. Pershouse, Benaraby
Mountain Chief	2840	5	Bay	A. Marlow, Thangool
Pine Vale Darnley	2874	5	Bay	State Farm, Palen Creek
Prince Globe	2875	Aged	Bay	Forge Bros., Tamworth
Royal Dignity	2864	5	Bay	E. Reinbott, Crawford
Royal Duke	2865	6	Bay	A. H. Lowe, Bollier
Royal Lustre	2775	5	Bay	H. A. Stuhmcke, Glenore Grove
Sir Dignity	2785	5	Bay	P. Keane, Linthorpe
Siren	2786	5	Grey	D. A., A. F., and H. L. Wormwell, Meandarra
St. Helen's Cavalier	2787	Aged	Bay	W. Baumgarten and Sons, Meandarra
Sultan Duke	2776	6	Brown	R. Tones, Mount Kilcoy
Talgai	2841	5	Bay	Chalk and Son, Clermont
Terang Duke	2801	5	Bay	C. A. H. Head, Swanfels
Trementheere Royal	2866	6	Bay	A. H. Tanzer, Abercorn
Trump	2842	Aged	Bay	Estate J. H. Wells, Rewan, Rolleston
Vamhire Heir	2777	5	Bay	F. H. Hahn, Coulson
Warrah Knight	2843	6	Bay	R. Schmidt, New Twin Hills, Clermont
Wyoming Final Tide	2867	5	Bay	Fairymead Sugar Co. Ltd., Bundaberg

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1941-42.

Arrowloon	2085	4	Chestnut	R. M. Nolan, Blair Athol
Bachelor's Patrol	2096	4	Chestnut	F. J. Burgess, Ellesmere, Kingaroy
Beau Force	2058	4	Bay	E. Blomfield, Meenawarra, Cecil Plains
Beau Geste	2086	3	Bay roan	J. P. O'Connor, Miriam Vale
Blazer	2059	4	Bay	H. V. Littleton, Crow's Nest
Bluecoat	2087	3	Chestnut	C. F. G. Collins, Strathmuir, N. C. Line
Brown Beau	2098	3	Bay	R. L. Horton, Dallarnil
Calliope	2088	4	Grey	Fitzroy Estates, Jellinbah, Blackwater

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1941-42—*continued.*

Name.	No.	Age.	Colour.	Owner.
Dauntless	2092	3	Bay ..	Estate T. M. Kelly, Glen Isla, Kunwarara
Da Vinci	2039	3	Brown ..	A. Korner, Kulgun
Dean Mond	2089	4	Bay ..	H. A. McIntyre, Ruby Vale
Feu-de-Joie	2112	4	Chestnut ..	A. Strong, Lismore
Flying Prince ..	2069	3	Chestnut ..	Mrs. D. F. Turkington, Pilton
Gaine On	2097	3	Bay ..	R. W. Ball, Dakiel
Grey Lad	2071	4	Grey ..	H. M. Glasser, Goondiwindi
High Spear	2090	4	Chestnut ..	E. H. Faint, Pioneer, Clermont
Lyonjack	2118	4	Bay ..	V. Corvi, Mitchelton
Ned Kelly	2070	6	Bay ..	J. J. Murphy, Emu Vale (Provisional)
Noble Denis	2072	4	Chestnut ..	K. J. J. Brosnan, Killarney
Promise	2073	3	Bay ..	J. Brosnan, Killarney
Rabbi Chief	2119	4	Chestnut ..	E. Fitzgerald, Austin street, Newstead
Rambling King ..	2074	3	Brown ..	E. A. Chandler, Silverspur (Provisional)
Royal Spear	2040	4	Bay ..	R. Jackson, Munbilla
Sassoma	2113	3	Bay ..	A. Strong, Lismore
Sunrise	2091	3	Brown ..	E. A. Hawkins, Ducalbrook, Bogantungan
Wheat Grain	2093	4	Bay ..	N. G. Walker, Fairfield, Duaringa
Worrah	2120	4	Bay ..	T. Ryan, Worrah, Goondiwindi

PONY STALLIONS CERTIFICATED FOR THE YEAR 1941-42.

Bobbie	2041	3	Brown ..	D. Neilson, Riverview, *via* Ipswich
Byron	2042	4	Creamy ..	E. A. Costello, Lacey's Creek, Dayboro'
Dr. Robin	2114	4	Bay ..	A. W. Luton, Murwillumbah
Gay Lad	2060	4	Bay ..	L. W. Henschell, Yarranlea
Little Foot	2115	3	Bay ..	A. W. Luton, Murwillumbah
Lord Leo	2061	4	Brown ..	F. Donnelly, 4 Dally street, Toowoomba
Stormy	2043	4	Piebald ..	M. G. Beetham, Forest Hill
Toy	2062	3	Black ..	C. H. Pendergast, Brigalow

TROTTER STALLIONS CERTIFICATED FOR THE YEAR 1941-42.

Dusky Derby ..	2121	4	Bay ..	H. H. Napper, Pimpama
Flying Teddy ..	2099	4	Chestnut ..	B. Gannon, Ellesmere, Kingaroy
Sing Boy	2063	4	Bay ..	W. O. Brennan, Oakey
Teddy's Memory ..	2116	3	Brown ..	B. Stephan, Templin

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1941-42.

Abbey Day	2044	3	Black ..	H. Zirbel, Mount Sylvia
Ballymena Intent ..	2124	5	Bay ..	M. F. Cornford, Drillham (Provisional)
Balwherrie Prince ..	2122	3	Brown ..	W. Davidson, Boyland
Billabong Henry ..	2045	4	Bay ..	Queensland Agricultural High School and College, Lawes
Bob	2094	3	Bay ..	W. J. Tysoe, Marmor
Bonnie Outlook ..	2075	3*	Bay ..	M. W. Browne, Loch Lomond, Warwick
Bruce	2100	3	Brown ..	V. A. Heading, Manyung, Murgon
Canaga's Duke ..	2064	4	Bay ..	M. H. Pickthorne, Canaga, Chinchilla
Captain Glen	2101	3	Bay ..	W. C. Dong, Adelaide street, Maryboro'
Caringal Kerr Gay ..	2076	4	Black ..	O. Zackrisen, Swanfels
Caringal Sandy ..	2077	4	Black ..	C. A. H. Head, Swanfels
Conondale Lad ..	2102	3	Bay ..	T. G. English, Conondale
Crystalene	2078	4	Bay ..	T. M. Brown, Willowvale, Warwick
Crystal Hope	2079	4	Bay ..	N. D. Nicholls, Pratten
Crystal Intent ..	2080	4	Black ..	V. C. Cutmore, Swanfels
Crystal Prince ..	2081	4	Black ..	N. D. Nicholls, Pratten
Fairymead Bold Romany	2103	3	Bay ..	Fairymead Sugar Co. Ltd., Bundaberg
Glengoon Chancellor..	2104	4	Bay ..	F. E. Mitchell, Byee, Murgon
Glenrandle Ebb Tide..	2082	3	Bay ..	P. Kerlin, Glenrandle, Killarney
Heroic's Pride ..	2095	3	Bay ..	W. R. Duncan, Blair Athol
Honest Rocket ..	2105	4	Bay ..	C. R. McConnell, Mundubbera
Joker	2065	4	Brown ..	J. H. Brown, Wutul
Jondaryan Adieu ..	2066	6	Bay ..	J. A. Tyson, Felton, Cambooya (Provisional)
Kimbar Knightley Lad	2046	3	Black ..	A. C. Wagner, Boonah
Laurence Drew ..	2083	3	Bay ..	E. C. McConville, Mount Sturt, Killarney Line
Lustre Again	2047	3	Bay ..	L. N. Edwards, Mulgowie
Major	2123	3	Bay ..	T. C. Wendt, Waterford
Majuba Rex	2067	4	Black ..	S. O. Mear, Toowoomba
Navillus Master Stroke	2117	3	Bay ..	C. O'Sullivan, Greenmount
Netherdale Rising Tide	2068	3	Bay ..	H. C. Sperling, Crow's Nest
Prince	2106	4	Bay ..	A. P. Conway, Wonga, Woolooga
Rose Farm Lord Lustre	2048	4	Brown ..	R. Drew, Forest Hill
Royal Chief	2107	3	Bay ..	H. E. M. Leggatt, Norwood, Gayndah
Royal Laddie ..	2108	4	Bay ..	Jackson and Paulger, Obi Obi
Royal Prince	2109	3	Blue roan ..	L. Harvey, Biggenden
Socks	2110	3	Bay ..	J. W. Anderson, Lagoon Pocket, Gympie
Sunnyvale Lustre's Choice	2049	3	Bay ..	C. A. Gnech, Teviotville, Boonah

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1941–42—*continued.*

Name.	No.	Age.	Colour.	Owner.
Sunnydale Prince ..	2050	3	Bay roan ..	F. W. Weier, Hatton Vale, Laidley
Surrandene Marquis ..	2051	4	Brown ..	J. Lehmann, Coolana, Rosewood
Tent Hill Fashion Pride	2052	3	Bay ..	W. H. Grams, Upper Tent Hill
Trumps	2111	4	Bay ..	A. A. Meissner, Coolabine Creek, Eumundi
Willowbank Skipper ..	2053	4	Black ..	T. O. Gnech, Boonah
Willowbank Star ..	2054	3	Black ..	J. Hamilton, Forest Hill
Willowbank Victor ..	2055	3	Bay ..	J. Hamilton, Forest Hill
Willow Grove Pride ..	2056	3	Bay ..	H. D. Redinger, Mount Sylvia
Young Hero	2057	3	Bay ..	J. J. Ahearn, Lower Mount Walker, Rosewood
Yugo	2084	3	Bay ..	J. O. Coleman, Cobba-da-mana

REJECTED STALLIONS.

List of stallions in respect of which Certificates of Registration were refused on account of lack of type and/or conformation, lack of size or unsoundness, during the year 1941-42. These horses are prohibited from service, either public or private:—

BLOOD STALLIONS REJECTED DURING THE YEAR 1941–42.

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Byron	4	Bay ..	Curb and L.C.	J. H. L. Parfitt, Mount Byron
Eureka Pride	6	Bay ..	L.T. and C...	A. B. Peatey, South Bingera
Flying Denis	6	Bay ..	Curb ..	F. J. Cotter, Goomeri
Gloveman	Aged	Bay ..	L.T. and C...	T. W. Lewis, Moolboolaman
Lord Buzzard ..	5	Chestnut ..	Unicrypt ..	H. N. Ballantyne, Calliope
Midbeau	6	Bay ..	Ringbone ..	R. A. Young, Charleville
Niddala	4	Brown ..	Unicrypt ..	A. Strong, Lismore
Palomond	Aged	Bay ..	L.T. and C...	D. G. Grayson, Killarney
Rex	5	Bay ..	L.T. and C...	E. A. Schroder, Kureelpa
Rivory	5	Bay ..	Spavin ..	H. A. Burnham, Wooroolin
Silver Slip	Aged	Grey ..	L.T. and C...	A. P. Gibson, Boolboonda
Spear Shire	5	Brown ..	Unicrypt ..	L. Clark, Anchor Hotel, Rockhampton
Tieson	5	Bay ..	L.T. and C...	Jande Pastoral Co., Marrawing
PONY STALLIONS REJECTED DURING THE YEAR 1941–42.				
Ding Dong	3	Piebald ..	Osteoporosis	C. M. Darlington, Yandaran
Johnnie Walker ..	5	Brown ..	L.T. and C...	A. D. Groves, Bank's Creek, Gympie
Little Jack	Aged	Bay ..	L.T. and C...	H. Richards, Cynthia
Little Jim	Aged	Bay ..	L.T. and C...	J. A. Lewis, Post Office, Warwick
Skipper	3	Bay ..	L.C.	A. J. Tupper, Ramsay street, Toowoomba
Socks	4	Bay ..	L.T. and C...	K. J. Widderick, Acland
Starlight	6	Bay ..	L.T. and C...	D. S. Plant, Cabarlah
TROTTER STALLIONS REJECTED DURING THE YEAR 1941–42.				
Condamine	3	Black ..	Curb ..	A. D. Knox, Belmont
Home Boy	6	Brown ..	L.S.T. and C.	L. Palmer, Kensington Estate, Bundaberg
DRAUGHT STALLIONS REJECTED DURING THE YEAR 1941–42.				
Bowler	Aged	Bay ..	L.T. and C. ..	W. L. Gleeson, Pozieres
Bullyard Prince ..	4	Black ..	S.B. and Unicrypt	Alexander and Sons, Sharon, Bundaberg
Donald	5	Bay ..	L.T. and C. ..	F. Graham, Blair Athol
Glenbar Barron Kerr	6	Bay ..	S.B.	A.M.L. and F. Co., Retro, Clermont
Punch	4	Bay ..	L.T. and C. ..	A. W. Skewes, Marlborough
Royal Add	5	Bay ..	S.B.	W. T. Gillies, Cooyar
Royal Tenor	4	Black ..	L.C.	S. Otto, Bum Bum Creek, Crow's Nest

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to this Department without delay.

General Notes

Staff Changes and Appointments.

Dr. J. Legg, D.V.Sc., M.R.C.V.S., Senior Veterinary Surgeon, Animal Health Station, Yeerongpilly, has been appointed Director of the Animal Health Station, Yeerongpilly.

Mr. P. C. Boettcher has been appointed assistant cane tester at the Isis mill for the remainder of the sugar season.

Mr. W. Ney (Strathalbyn, Collinsville) has been appointed an honorary protector of fauna in place of Mr. W. Sievers.

Messrs. J. R. Bailey (Curator of Parks and Gardens, Toowoomba) and J. V. Scanlan (Toowoomba) have been appointed honorary protectors of fauna.

Dr. J. Legg. D.V.Sc., Director, Animal Health Station, Yeerongpilly, has been appointed a member of the Veterinary Medicines Board in the place of Mr. J. A. Rudd, retired.

Mr. E. F. Tree (Currumbin) has been appointed an inspector under "*The Diseases in Plants Acts,* 1929 *to* 1937," and an agent under "*The Banana Industry Protection Acts,* 1929 *to* 1937," Department of Agriculture and Stock.

Messrs. C. Schindler and E. J. Lorraine, inspectors under *The Diseases in Plants Acts,* have been transferred from Wallangarra to Moorooka, and from Moorooka to Wallangarra, respectively.

All inspectors under *The Diseases in Stock Acts, The Slaughtering Act,* and *The Dairy Produce Acts* have been appointed also inspectors under *The Diseases in Poultry Acts,* Department of Agriculture and Stock.

Messrs. A. A. Ganter and H. W. Tucker (Yeppoon) have been appointed honorary rangers under *The Native Plants Protection Act* and honorary protectors of fauna.

Mr. A. Corcoran, Head Teacher, Allan State School, near Warwick, has been appointed an honorary protector of fauna.

Constable V. D. Mant (Croydon) has been appointed also an inspector under *The Slaughtering Act.*

Mr. L. M. Hodge, manager, Callide Cotton Research Farm, Biloela, has been appointed acting senior instructor in cotton culture, Dalby.

Mr. W. A. R. Cowdry, instructor in cotton culture, has been appointed acting manager, Callide Cotton Research Farm, Biloela.

Mr. A. W. S. May, assistant to research officer, has been transferred from Nambour to Gayndah.

The following inspectors of workers' accommodation have been appointed also inspectors under the *National Security (Emergency Supplies) Rules of* 1941 for the purpose of policing the Rule relative to the provision of reserve stocks by employers for the districts opposite to each:—

Mr. G. W. Jackson—Balonne, Bendemere, Booringa, Bungil, Murweh, Roma, Taroom, Warroo.

Mr. D. B. Wilson—Barcoo, Bulloo, Charleville, Paroo, Quilpie, Tambo.

Mr. J. J. M. Manski—Aramac, Barcaldine, Bauhinia, Belyando, Blackall, Emerald, Ilfracombe, Isisford, Jericho, Longreach, Peak Downs.

Mr. J. C. Perrett, Boulia, Diamantina, Dalrymple, Flinders, Hughenden, Wyangarie, Winton.

Mr. O. Duffy—Barkly Tableland, Burke, Carpentaria, Cloncurry, Croydon, Mackinlay.

Mr. W. C. Toohey—Cook, Etheridge, Woothakata.

Mr. E. J. L. Clarke—Wangaratta.

Fruit Marketing.

Regulations under *The Fruit Marketing Organisation Acts* have been amended to provide for optional preferential voting in respect of the election of members of sectional group committees.

Close Season for Snipe.

An Order in Council issued under *The Fauna Protection Act of* 1937 varies the period of close season for the Australian Snipe from 1st October in each year to 30th April in the following year to 15th February to 14th November in each year, inclusive, throughout Queensland. This, in effect, means that the open season for snipe extends from 15th November in each year to the following 14th February, both inclusive.

State Wheat Board.

The election of four growers' representatives on the State Wheat Board resulted in the return of the present members. The voting was—W. J. Brimblecombe, Pirrinuan, 1,023 votes; T. W. McIntyre, Yarranlea, 978 votes; A. C. V. Bligh, Condamine Plains, Brookstead, 919 votes; J. G. Tod, Yandilla, 913 votes; and W. J. Daly, Wiyarra, 447 votes.

The new Board will be appointed for a term of three years.

Bingera Mill Levy.

Regulations issued under *The Primary Producers' Organisation and Marketing Acts* empower the Bingera mill suppliers' committee to make an additional levy for administrative purposes, at the rate of ½d. per ton, on suppliers of sugar-cane to the Bingera mill.

Control of Stickfast Flea.

Following the appearance of the Stickfast Flea of poultry on certain properties in the Kalbar-Teviotville district, an Order in Council has been issued under *The Diseases in Poultry Acts* declaring the poultry districts of Boonah and Normanby to be an infected area for the purposes of the Acts.

Regulations also have been issued which will cover the movements of poultry within or without such infected area.

For the purpose of providing adequate supervision in connection with this outbreak, the following appointments have been made:—

Messrs. J. C. J. Maunder, A. R. Nott, and A. F. S. Ohman, Government veterinary surgeons; L. G. Newton, assistant to veterinary surgeons; and E. T. Lewin, inspector of dairies, Boonah, have been appointed also inspectors under *The Diseases in Poultry Acts*. Mr. A. W. McLauchlan, field assistant (poultry), has been transferred from Brisbane to Boonah.

Cheese Board.

The following have been nominated for appointment as members of the Cheese Board:—

Messrs. T. Dare (Woodleigh), R. C. Duncan (Pittsworth), M. McIntyre (Mount Tyson), D. G. O'Shea (Southbrook), R. W. Thomas (Toowoomba).

An election, closing at 12 noon, will be held on 2nd December, 1941. Three members are required.

National Security.

An amendment of the *National Security (Emergency Supplies) Rules of* 1941 provides that the period for which bread improver is to be stored shall be four weeks instead of six weeks.

Noxious Weeds.

The following weeds have been declared noxious weeds throughout Queensland:—

African Box Thorn (*Lycium afrus*); Bathurst Burr (*Xanthium spinosum*); Blackberry (*Rubus fruticœus*); Cape Spinson (*Amex Australia*); Coca Leaf (*Erythroxylon coca*); Finger Cherry (*Enedomyrtus macrocarpa* Benth.); Flannel Weed (*Sida cordifolia*); Green Cestrum (*Cestrum parquii*); Groundsel Bush (*Baccharia halimifolia*); Indian Hemp (*Cannabis sativa*); Khaki Weed (*Alternesthera schyrantha*); Mint Weed (*Salvia lanceifolia*); Mist Flower (*Eupatorium riparium*); Needle Burr (*Amarantus spincsu*); Noogoora Burr (*Xanthium strumarium*); Onion Weed (*Asphodelus fistuicaus*); Opium Poppy (*Popover couniferum*); Patterson's Curse (*Echium plantagineum*); Prickly Poppy (*Argemena mexicana* var. *orchreleuea*); Rubber Vine (*Cryptostegia grandiflora*); Saffron Thistle (*Carthamus lanatus*); Variegated Thistle (*Silybum marisnum*); Balloon Cotton or Cape Cotton (*Gomphocarpus fruticosus* and *Gomphocarpus physocarpus*).

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. **"Flaveria."**

A Thorn Apple.

D.G.O'S. (Toowoomba)—

Your specimen is *Datura ferox*, a species of Stramonium or Thorn Apple, a native of Southern Europe, now a very common naturalised weed in parts of Queensland, especially on the Western Darling Downs. So far as we know, it first made its appearance about Macalister about twenty years ago or more, but now has become very widespread, particularly during the past few years.

Practically all species of Datura or Stramonium are poisonous to stock, although, fortunately, they are not often eaten in the green state. The chief trouble occurs when the plants are present as weeds in cultivation, and are chaffed along with the standing crop. They are sometimes eaten with impunity, but the danger is always there.

✓Plants from Blackall District Named.

E.M.B. (Yaraka)—

1. *Eragrostis xerophila*. An excellent sheep grass. One of the love grasses, and, along with several others, commonly called Never Fail or Never Tire.
2. Cannot be sure of this grass from the butt alone. Could we possibly have a specimen later on with seed heads?
3. *Diplachne Muelleri*. An excellent fodder. Your local name Mulga Couch is noted with interest.
4. There is a bit of a mixture here; a piece of one of the blue grasses, also of Wild Millet (*Echinochloa Turneriana*), a remarkably good fodder on the flooded country.
5. *Eulalia fulva*, Brown Top. The value of this grass seems to vary a good deal from district to district, and according to class of country. The form you send is rather a coarse one, which commonly grown on the flooded country.
6. *Neurachne Mitchelliana*, Mulga Grass; an excellent fodder in mulga country.
7. *Aristida latifolia*, one of the 3-pronged spear grasses.
8. *Aristida Muelleri*, a spear grass with a much softer seed than most of the others, and apparently quite a good fodder.
9. *Aristida arenaria*, a bad spear grass.
10. *Eragrostis setifolia*, one of the love grasses. This, and one or two other species that grow on flooded country, are commonly known as Never Fails, or Never Tires, and are an excellent feed for sheep.
11. *Themeda avenacea*, Oat Grass. As you say, this grass possesses a very obnoxious seed. It is closely allied to Kangaroo Grass.
12. *Eragrostis laniflora*. It is closely allied to Nos. 1 and 10.
13. *Trianthema portulacastrum*, commonly known in Queensland as the Black Pigweed or Hog Weed. It is a native of tropical America, that has been established in Queensland now for about twenty years. It has become a very serious pest in some of our farming areas, particularly on the cotton fields of the Callide Valley.

Carob Bean.

R.G.B. (Hughenden)—

Our supply of Carob Bean (*Ceratonia siliqua*) seeds is now exhausted, because of very heavy demands, so that if you want further seed for trial you would have to get it from a Southern source. Messrs. Law, Sumner, and Company, seedsmen, Melbourne, advertise seed at 1s. 6d. per packet.

Shade Trees for the Nor'-West.

R.G.B. (Hughenden)—

Portuguese Elm (*Celtis sinensis*).—This tree is worth trying in your locality, and the leaves are excellent fodder for stock. The demand for seed has been very heavy this year and we have only a few left. These, however, have been sent you. If sown in an ordinary garden bed, they transplant very easily, especially in the late spring, and if kept watered when newly planted out.

Following are further suggestions:—

Kurrajong—seed can be obtained from Messrs. A. Murphy and Sons, Woy Woy, New South Wales.

Bottle Tree, both broad- and narrow-leaved varieties. Seed of the former, which does remarkably well in North-Central Queensland, can be obtained, we think, from the Curator, Botanic Gardens, Rockhampton. The narrow-leaved variety could probably be obtained from Roma or Dalby.

Trees already growing in your area and which are doing remarkably well are:—

Parkinsonia—prickly, but makes a handsome tree when well looked after, but sometimes inclined to run out and become somewhat of a pest.

Acacia—the tree commonly called "Acacia" in Western Queensland is *Albizzia Lebbeck*. It is rather subject to borer attack.

White Cedar, Pepper Tree.

Bauhinia—the native Bauhinia does remarkably well, but is of rather slow growth.

Phytolacca dioica, the Phytolacca or Bellasombra Tree, is a tree worth trying. You could obtain seed from Mr. R. Dick, Purga, price 2s. per large packet.

The Forestry Department supplies trees to farmers and pastoralists at the very reasonable rate of 5s. 6d. per dozen for tubed plants. Among the trees distributed and which we think would do well in your district, or which are at least worthy of trial, are:—

Western Cypress, Crow's Ash, Loblolly or other Pine, Mexican Cypress or Arizona Cypress.

If you are interested, get in touch with the Secretary, Forestry Sub-Department, Executive Buildings, Brisbane.

Johnson Grass.

C.E.F. (Goomeri)—

The specimen is, as you suspect, Johnson Grass (*Sorghum halepense*), a native of the Mediterranean regions, now widely spread in most warm temperate and subtropical countries. The plant is poisonous to stock since, like most other sorghums, it contains a prussic-acid-yielding glucoside. Ordinary paddock stock, however, have been fed on the grass with impunity. Most of the trouble has been where hungry animals have been allowed to eat the grass freely on an empty stomach. If cut and allowed to wilt before feeding, the danger from poisoning is considerably lessened.

As in all plants with an underground food storage system, all attempts at eradication should be aimed at keeping down the leaf growth by cutting or mowing, as in this way the stored food is gradually used up.

Duck Weed.

E.M.H. (Ashgrove)—

The specimen represents the Duck Weed (*Lemna minor*). This plant propagates very quickly by vegetative means, and soon covers the surface of a pond. Raking is generally the best method of getting rid of it. It sometimes tends to die out in the hot weather. Raking over the surface of the pond, if done regularly, should keep the plant in check, but as you say you have done this, you could try spraying with commercial sprays. Copper sulphate, ½ lb. to 10 gallons of water, sprayed evenly over the surface, is recommended. If you prefer, you could use Bordeaux mixture, which you can obtain already made up in tins from most nurserymen. It is a fungicide, and in spraying aquatic weeds it should be used only half the recommended strength of the tins.

Rural Topics

Guarding Britain's Farm Lands from Fire Bombs.

With about 13,000,000 acres now under the plough this spring—nearly 4,000,000 more than in 1939—Britain's farmers made elaborate plans to protect their grain crops from fire bombs.

Last year Germany's air onslaught did not develop fully until the harvest was gathered in, but this year things were different, and the menace to British food supplies was very real.

This is what the British farmers did: They cut firebreaks or lanes, about 30 feet wide, across the direction of the prevailing wind. The crops, cut green, were not wasted, but were made into hay or silage. Corn stooks were protected by setting the rows as far apart as possible. Haystacks were set at least 15 yards apart, and preferably out in the field, to prevent enemy landings.

For dealing with outbreaks of fire, water carts were kept filled near the standing crops, and further reserves stored in handy places.

Fire fighters had stirrup pumps, fruit spraying machines, liquid-manure carts, and fire-beaters all ready for instant action. Tractors were useful for ploughing a firebreak quickly in the path of advancing fires and scythes for isolating small patches.

With fire-watchers, A.R.P. wardens, and Home Guards in every parish, there was no lack of man-power to safeguard the vital harvest of 1941.

The Stickfast Flea—Another Pest Importation.

It is a remarkable thing that most of Australia's pests, both animal and vegetable, have been imported in one way or another—some deliberately and thoughtlessly, others accidentally in packing material and by other means. Once Australia, by reason of comparative isolation and distance from other lands had some immunity from the risk of pest invasion—a sort of natural quarantine period. To-day, however, with speedy transport, especially by air, much of that natural immunity no longer exists. So it is easy to understand the alarm felt when the stickfast flea—another imported pest—was reported recently from the Boonah district as infesting a farmer's fowls.

The stickfast flea, what we know of it, was first known as an introduced pest in the Southern States of America and other places with a warm climate. It is smaller than the ordinary flea, and is about one twenty-fifth of an inch in length. It hops like any other flea and just as far. When it finds a suitable place on the body of its host, preferably parts devoid of feathers or fur, it attaches itself firmly to the skin of the host bird or animal, and starts sucking its blood. It sticks to its host like a bank to a security, and that may be why it is called the stickfast flea!

Unlike the ordinary flea—especially the church flea—it is not satisfied with one feed on the one spot. It groups in clusters or colonies and causes the equivalent of tick worry in cattle. So far as we know, it is the sucking of the blood and consequent irritation that causes the worry and leads eventually to the death of the fowl. It also has been found in calves and horses which, however, are apparently not seriously affected by it. But on smaller animals—dogs, cats, and wallabies, chickens, pigeons, and other birds, it can become serious in its effects and spreads more rapidly and widely.

Another unusual thing about the stickfast flea is that it doesn't leave its host to lay its eggs. When laid, its eggs drop off and are hatched in the droppings of the host animals. So, obviously, one of the most effective ways of preventing its spread is to keep fowlhouses, yards, and other premises clean; and where infestation has occurred, all manure and litter should be completely destroyed. Water, it is believed, will destroy the larvæ, so, if that is proved, immersion—that is complete immersion—of manure in water for a reasonable time would be effective, and the value of the manure as a fertilizer retained. But it is no use just sprinkling or lightly soaking the manure, for that would simply aid both the hatching of the eggs and the development of the larvæ, and so perpetuate infestation of the flea. Sandy soil, as with other fleas, is a very effective breeding ground of the stickfast flea pest.

The stickfast flea has been found in other parts of Australia, but not previously in Queensland.

Insect Pests as a Fifth Column.

It doesn't happen, of course, in these days of strict petrol rationing, but when we were able to speed along the Pacific Highway to Sydney and other places in other States, we all had that feeling of temporary annoyance—unreasonable as it was—when pulled up by vigilant quarantine inspectors with the query—"Any plants or flowers in your car?" Why the fuss—a harmless plant in a pot isn't a bomb. That's right, but, all the same, it might harbour an insect pest that would kill more fruit trees than an October bush-fire, and so destroy more food than a whole "stick" of bombs.

The fact is that we have an insect fifth column which is ceaselessly sabotaging the economy of the State—hence these roadside inspections and the vigilance of our fruit inspectors at the Border.

Over in the United States, Government entomologists have estimated that insect pests cost that country over 1,600,000,000 dollars—roughly £300 millions in our money—every year, or the equivalent of the services of a million men. And, as in Australia, most of the serious pests affecting the farming industry were imported—that is they entered the country in various ways—in introduced plants, packing material, and so forth.

Mosquitoes head the list, with the cotton boll weevil second. Then come the corn earworm, the housefly, and the rice weevil.

Like Australia, for pests, America is a land of opportunity. Of the fifty worst insect pests, about a third have come from other countries. They came as stowaways on ships and aeroplanes. They came hidden in straw, in fertilizing material, and in plants and flowers. In fact, in Queensland, some of our most serious pests of sugar-cane have been brought in with new cane plants by some smart canegrowers who, in the earlier days of the sugar industry, thought they were clever in dodging quarantine inspectors with their cane plant importations.

In spite of the most careful quarantine, new pests may be introduced. So when any unfamiliar pest is discovered we should immediately let the Department of Agriculture and Stock know all about it. That's what the Boonah farmers did when they found the stickfast flea in their poultry flocks. As a result, the alert men concerned got busy without a moment's delay to isolate, if possible, the area of infestation.

How important this action is can be understood when we remember that the destructive Japanese beetle was unknown in the United States before the first world war. It apparently came with a cargo from overseas. The elm bark beetle, which causes the dreaded Dutch elm disease, was brought to America in the wood of a crate containing English china. Larvæ of a small injurious moth were found in a string of beads made of seeds from Italy.

The Hessian fly is believed to have arrived from Europe in straw used as bedding by Hessian troops who fought in the American revolution. The Hessian fly soon did far more damage than the Hessian troops themselves.

The Argentine ant—which was discovered in Victoria some time ago and promptly exterminated, may have come in coffee from South America.

Of course, every insect pest is not harmful, and many are beneficial. For instance, the Australian lady bird was sent to California to combat the cottony-cushion scale in citrus orchards. In return, we got the cactoblastus, which freed Queensland from the prickly-pear curse. At Boonarga, farmers have built a memorial to the cactoblastus.

All the same, there is need for eternal vigilance where insect pests are concerned, and it is still a question as to who will inherit the earth—Man or Bug.

Types of Soil.

A sandy soil is described as light, and sandy and loamy soils are spoken of as open and free-working. Friable soils are readily crumbled between the thumb and fingers. A clay soil is described as heavy because it is sticky and tenacious; it may also be termed stiff or stubborn. A "mellow" soil is one which by natural or artificial means is reduced to a fine state of subdivision of the particles. A "hungry" soil is one that is greedy of manure and water with little power of retaining either a poor sandy soil for example. A "cold" soil contains an excess of clay or humus, both of which retain water. A "shallow" or "thin" soil is one in which the distance from the surface to the subsoil is but little. A "deep" soil, such as many clays, is of considerable thickness. For nearly all purposes loams make the most suitable soils.

Farm Notes

DECEMBER.

EARLY-SOWN crops of sweet sorghums, sudan grass, millet, and maize, intended for fodder purposes, will now be in an advanced stage of growth where seasonal conditions have been favourable. Every effort should be made, where practicable, to conserve any surplus growth in the form of silage, hay, or stover. Trench, pit, or stack silage is recommended as economical and profitable means of conservation where an overhead concrete silo is not available. However, it is the autumn-harvested crops which usually provide the greatest bulk of conserved fodder; so December sowings of suitable bulky summer fodder crops are best for that purpose.

In localities where lucerne does not make satisfactory growth, the cowpea will often provide an alternative protein-rich fodder, besides being a valuable rotation crop of benefit to the soil. Cattle will not take readily to green cowpea, preferring the fodder in an advanced stage of growth, but once accustomed to it they will graze freely on it.

Sowings of main-crop maize will be continued during the month where conditions are suitable, utilising late-maturing varieties such as Improved Yellow Dent; but in districts where early frosts are experienced, the mid-season or early varieties are preferable.

Buckwheat is recommended as an early maturing alternative fodder crop, or as green manure where it is desired to plough under within six to eight weeks. Besides being a good fodder, buckwheat is valued as a bee plant, while the seed makes excellent poultry feed. Wheat-harvesting will be practically finished this month. Growers are, therefore, advised to give the land a preliminary working immediately after the burning or grazing of stubble in order to conserve succeeding summer rains. Even where the land is too hard for adequate ploughing, a light working with disc cultivator or sundercut will be found very beneficial.

Experience in recent years has proved that adequately summer-fallowed land invariably produces profitable yields.

December is usually a busy month, because of successive sowings of fodder and grain crops and the scarifying of row crops already established.

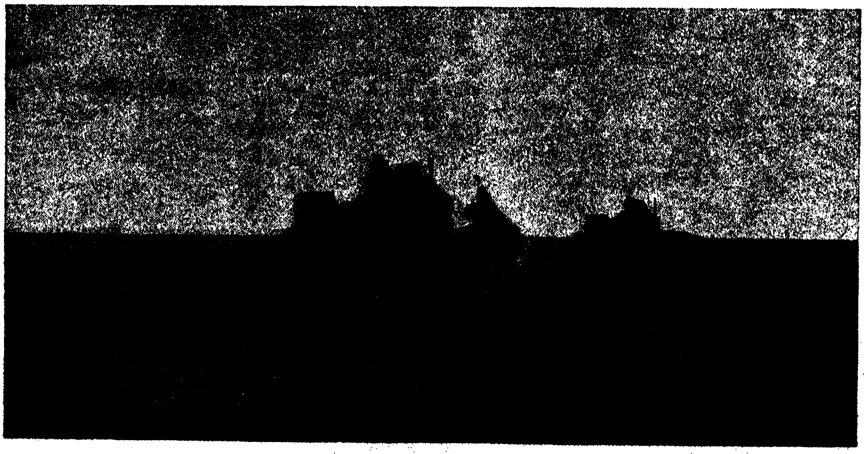


Plate 157.

AUTO-HEADERS AT WORK, SOUTHERN DARLING DOWNS.

Orchard Notes

DECEMBER.

THE COASTAL DISTRICTS.

PLANTING of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young, they take a long time to recover and consequently the fruiting period is considerably retarded.

Citrus orchards require constant attention; the land should be kept well worked and all weed growth destroyed. Spraying for scale insects should be done where necessary.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and lemons will be in season during the month.

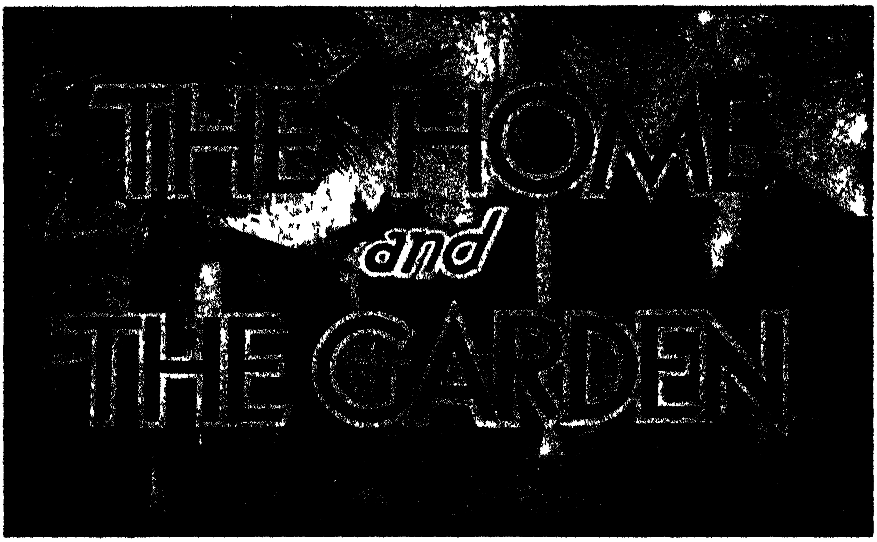
Examine potatoes and tomatoes for Irish blight, and melons and kindred plants for downy and powdery mildew. Use bordeaux or burgundy mixture for Irish blight and downy mildew and sulphur dust or lime sulphur spray for powdery mildew.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.
THE COASTAL DISTRICTS.

EARLY-ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle. The season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. Early ripening fruits should be carefully graded for size and quality, handled and packed with great care, and nothing but choice fruit sent to market.

Orchards and vineyards should be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later-ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, unless, of course, there is a good fall of rain in the meantime.

Codling moth and fruit-fly regulations should be observed strictly in order to keep these pests under control: otherwise the later-ripening fruits are likely to be attacked severely by these pests.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

CHILDREN'S EYES.

WE have chosen "eyes" as the subject for our talk this month, because the present craze for dressing little girls in the fashion of child film stars has resulted in much unconscious cruelty to tiny tots who have been forced to go about the streets in the brilliant sunny weather of Queensland with nothing on their heads but a large bow of ribbon. Several times in the last few days I have seen mothers, themselves protected by the shadiest of hats, dragging by the hand small bareheaded boys or girls whose eyes were painfully screwed up in an effort to secure protection from the glare.

Tiny babies are equal sufferers, not because they are taken out without hats, but because their head covering is confined to a small brimless bonnet which leaves their eyes exposed to the full rays of the sun unless mother carries a sunshade.

It may help mothers to understand advice on the care of the eyes if we "begin at the beginning" and consider baby's eyes from birth onwards.

The Development of Sight.

The newly born infant avoids the light, and the eyelids will be seen to close if he is taken into a strong light. Continuing during the first few weeks of life, the behaviour of the infant indicates that excessive light is unpleasant. Therefore the room in which a newly-born infant is placed should be darkened, and for the first few weeks the eyes should be protected against strong light.

It will be noted that gradually the eyes become accustomed to light, and baby will turn his head and follow a light in a room. As he becomes older he shows distinct signs of pleasure if a brightly-coloured object is held before him. By the time baby is three months old he should be able to recognise his mother, although it may be her smile rather than her features to which he responds. By the age of six months he should be able to recognise many familiar things, although it is some time before he is able to gauge their distance from him.

To test a baby's power of seeing, we should watch and note whether his eyes will follow a moving light or a bright object. His vision may also be tested by bringing the point of a finger close to the open eyelids and observe whether it makes him blink. This may not cause blinking in a normal baby under two months old.

During the first few weeks of life the surface of the eye is not very sensitive, and water may be splashed on it without causing blinking. The eyelids of the young baby move irregularly and are often faintly separated during sleep.

Muscular Development.

As we have explained in other lectures, the muscles of the body are so grouped that by their pull one against another the various structures are kept in their proper position. This is not so at first in the case of baby's eyes. The muscles of the eyes of the newly-born baby do not work in harmony. It is not until baby is three months old and even older that any co-ordination of these muscles occurs, so that very young babies often appear to have a slight squint.

However, if an older child squints it may be due to a definite defect in the working of the eye muscles or to unequal vision in the eyes themselves, and the child should be taken for advice to a hospital or an eye surgeon. A squint may also be the first sign of lead poisoning, and therefore mothers should always pay attention to the appearance of a squint.

Discharging Eyes.

Not uncommonly, infants suffer from a "watery eye," and a bead of matter collects each morning at the inner corner of the eye. This is usually due to a blocking or narrowing of the lower end of the tear duct which normally conducts tears from between the lids into the nose, where they evaporate. The obstruction may be removed by carefully applying pressure with the tip of the little finger to the skin surface of the inner side of the eye. This should be done several times each day. If the troubles does not improve within a month or so, medical advice should be sought.

The eyes of the newly-born infant may become inflamed as the result of infected matter getting into them during birth. In order to prevent this, the attending doctor or nurse cleans baby's eyes with a special lotion immediately baby is born. If at any time after leaving hospital mother notices redness or swelling of baby's eyelids or a mattery discharge, she should take baby to a doctor as soon as possible. If the lids of an inflamed eye stick together, do not attempt to separate them with your fingers, or the delicate surface of the eye may be injured and cause the inflammation to spread to deeper parts. With the aid of a piece of clean cotton-wool or soft, white boiled rag gently bathe the lids from the inner to the outer side of the eye, using warm boiled water. Never use the same piece of wool twice.

The discharge from an inflamed eye may infect the eyes of other people in the house, and so the greatest care must be used not to carry infection by fingers, washers, towels, &c., to baby's other eye or to other persons. Everything used for the baby must be kept separate, and mother must wash her hands very thoroughly with soap and water immediately after attending to baby's eye as well as before.

Protection from Glare.

All babies and children should wear hats or bonnets with a broad brim during very sunny weather. Perambulators should have unlined wicker hoods, and in the case of an infant carried in the arms the baby should be so turned that its eyes are shielded from the sun.

Backwardness and Defective Vision.

A child who is backward or appears to be slow in learning anything should have his eyes as well as his ears examined. Defective sight or hearing may make a child appear dull.

Care of Sight.

When the child reaches the age when he is reading and writing, care should be taken that the light falls upon the page without causing glare. At school the blackboard should be placed so that proper illumination is secured. If the board is placed to one side of a window which a child is directly facing, the glare may make it difficult for him to see the board.

Cleansing the Eyes.

In dusty, dry weather, particularly in the western districts, it is advisable to bathe the eyes frequently with warm salt and water (one teaspoon to one pint) or with boracic lotion (one teaspoon boracic acid to one pint water). The eyes should be protected from flies.

Foreign Body.

The surface of the eye is very sensitive and delicate and can be easily injured; therefore great care must be exercised in attempting to remove any foreign particle. A drop or two of castor oil may be instilled into the eye, and this may cause the particle to come away. If you experience any difficulty, do not persist, but consult a doctor. Should a speck of dirt get into the eye, examine the eye at once, drawing the lower lid downwards. If nothing can be seen, draw the upper lid over the lower. Ask the child to look towards his toes. If the speck is visible, remove it with the corner of a clean handerchief or a wisp of cotton-wool.

You can obtain information on this or any other matter relating to the feeding and management of children up to school age by writing to "Baby Clinic, Brisbane." Such letters need not be stamped.

IN THE FARM KITCHEN.

CHRISTMAS PUDDINGS AND SAUCES.

Christmas Pudding.

Take ½ lb. suet, ½ lb. raisins, ¼ lb. flour, ¼ lb. currants, ¼ lb. peel, ¼ lb. sultanas, 1 oz. almonds, grated rind, ½ lemon, 2 tablespoonfuls golden syrup, 2 eggs, ½ gill milk, ¼ nutmeg (grated).

Prepare the fruits. Chop the suet. Mix the flour and suet together. Add the lemon rind, nutmeg, and prepared fruits. Cut the peel into small pieces, blanch the almonds and cut into pieces. Add these to the other ingredients and mix well. Whisk up the eggs, add the golden syrup, and whisk together. Put into a greased basin, cover with greased paper and floured pudding cloth. Put into a saucepan of boiling water and steam for eight hours. Turn on to a hot dish and serve.

Children's Christmas Pudding.

Take ¾ lb. grated beef suet, 1 lb. breadcrumbs, ¼ lb. fine flour, ¾ lb. raisins (stoned and chopped), ¼ lb. sultanas, grated rind and juice 2 oranges, ½ teaspoonful salt, 4 eggs, ½ lb. golden syrup, ½ pint milk.

Mix the dry ingredients first, warm the syrup, and mix with the beaten eggs and milk, add the strained orange juice; then work the whole into a stiff paste very thoroughly. Keep over for two days, mix again, then put into two well greased moulds, tie down securely, and boil for four hours. Boil for another hour when going to use the puddings. A few blanched and split almonds should decorate the puddings when turned out of the moulds.

Rich Christmas Pudding.

Take 1 lb. finely chopped suet, 1 lb. brown sugar, 1 lb. stoned raisins, 1 lb. currants, ¼ lb. candied peel (cut in thin slices), ½ lb. flour, 8 oz. breadcrumbs, 8 eggs, 3 oz. almonds (blanched and shredded), 1 saltspoonful grated nutmeg, 2 tea spoonfuls baking powder, grated rind of 1½ lemons, 1 teaspoonful salt, about ½ pint milk, 1 gill brandy.

Thoroughly mix together all the dry ingredients, then stir in the eggs, which have been well beaten; add gradually the milk and, lastly, the brandy. This quantity will make four good-sized puddings. Place in buttered moulds or basins, and steam for five hours. When needed for table, steam another two hours. Serve with any sauce which is preferred.

Christmas Pudding.

Take 3 oz. flour, 6 oz. suet, 3 oz. breadcrumbs, 6 oz. stoned raisins, 6 oz. currants, 4 oz. minced apple, 3 eggs, 5 oz. sugar, 2 oz. candied peel, ½ teaspoonful spice, 1 small wineglassful brandy, pinch of salt, ½ teaspoonful nutmeg.

Mix together the flour, breadcrumbs, chopped suet, raisins, currants, minced apples, sugar, peel (minced small), nutmeg, spice, a pinch of salt, the brandy and whole eggs. Mix and beat these ingredients well together, pour them into a well-buttered mould or basin, spread a buttered paper over, then tie a cloth firmly over the top. Boil for four hours, keeping the pudding well covered with boiling water, then turn it out, sift icing sugar thickly over the top, pour two or three tablespoonfuls of brandy round, and, just before serving, set it alight. This pudding may be served with wine or punch sauce, or with rum or brandy butter.

Individual Christmas Puddings.

Take 4 oz. suet, ¼ lb. raisins, ¼ lb. currants, 2 oz. sultanas, 2 oz. candied peel, 1 oz. shelled walnuts, 4 oz. sugar, 3 oz. breadcrumbs, 1½ oz. flour, grating of nutmeg, ¼ flat teaspoonful ground cloves, 2 eggs, ½ gill rum.

Wash, pick over, and dry the fruits and stone the raisins. Shred the candied peel and chop up the walnuts. Sieve the flour with the spices, add the finely-chopped suet, and the breadcrumbs, then stir in the sugar, prepared fruits and nuts, and mix all together. Whisk the eggs and add them. Moisten the mixture with the rum and some milk as required. Beat it well and leave it to stand overnight, adding more moisture after that time, if necessary. Turn the mixture into six buttered moulds. Cover them securely with buttered papers and steam them for about an hour and a-half or two hours. Unmould the puddings and serve them with half a shelled walnut on each.

WATERING IN DRY WEATHER.

DR. D. A. HERBERT.

In periods when the water supply is restricted it is more than ever desirable to see that what water is put on the garden is used to the best effect. It is very easy to waste a lot of time sprinkling garden beds and yet to get very little benefit, and this applies especially when an attempt is made to get round the whole of the garden in a limited time. These quick waterings moisten the surface of the soil and the leaves of the plants, but do not penetrate far down. The deeper layers, where the roots are, may not get any benefit, and because the top layers are moistened regularly the roots tend to come to the surface where they are in great danger of drying out, or of being injured by the heat of the sun.

The best plan is to work out a routine of watering and to see that each bed gets a good soaking from time to time, instead of frequent sprinklings. Where it is not possible to give a weekly soaking, individual plants may be tended by making a small earth-wall round the base and filling up the depression two or three times with water as the soil becomes dry.

The amount of water that a plant can use depends, of course, on the plant. A tree may get rid of gallons of water every day, but an ordinary garden plant, like a dahlia, may use little more than a pint or so each day, and the amount is correspondingly smaller for, say, a strawberry plant. If we accept that about six gallons a month is the water ration for a maize plant, we might, perhaps, conclude that all that is necessary is to give it a kerosene tin and a-half each month. The trouble is that all the water put into the soil is not used by the plant. Some of it never gets near the roots, but the most serious loss is by evaporation from the soil. The surface of the soil dries out very quickly in dry weather. For water economy, therefore, this source of loss has to be cut down, so that more of what is put in will be available to the roots. A mulch of dead leaves, cut grass, or animal manure is useful for the purpose. It protects the soil from drying out, and when later the bed is dug over it can be incorporated in the soil to improve its texture. Where it is not possible to obtain enough material to make a mulch the scuffling up of the surface of the soil with a hoe is an aid to moisture conservation.

One further recommendation is to avoid sprinkling leaves in dry weather. Wet leaves actually lose more water than dry ones, and often the roots cannot keep up a sufficient supply, though perfectly capable of doing so if the leaves are kept dry. It is often noticed that plants wither suddenly after rain, and though this may be the result of fungal attack, it is often due to the fact that the rain-wetted leaves are losing water too fast for the roots to supply the deficiency. It is very doubtful whether overhead sprinkling is of much use except in so far as much of the water so given finds its way into the soil. The amount actually absorbed by the leaf is not great, and has the disadvantage mentioned, it induces the leaf to give off its water supply more rapidly.

The remark that a good shower of rain is better than any amount of hosing or hand watering has an arithmetical basis. An inch of rain on an average small garden might be the equivalent of 5,000 gallons of water, and it is not surprising that it gives better results than ordinary hosing, apart from any considerations, such as hardness of the water supply. It might be pointed out, too, that an occasional good shower is much more beneficial than more frequent light sprinkles that moisten the surface only, which brings us back to the point from which we started.

ASTRONOMICAL DATA FOR QUEENSLAND

DECEMBER, 1941.

By A. K. CHAPMAN, F.R.A.S.

SUN AND MOON.

AT WARWICK.

Dec.	SUN.		MOON.	
	Rises.	Sets.	Rises.	Sets.
	a.m.	p.m.	p.m.	a.m.
1	4.48	6.34	4.14	3.6
2	4.48	6.35	5.5	3.43
3	4.48	6.36	5.56	4.23
4	4.48	6.37	6.47	5.4
5	4.48	6.38	7.37	5.49
6	4.48	6.38	8.24	6.36
7	4.48	6.39	9.10	7.26
8	4.49	6.39	9.53	8.18
9	4.49	6.40	10.36	9.11
10	4.49	6.40	11.16	10.6
11	4.49	6.40	11.55	11.2
12	4.49	6.41	nil	12.0
			a.m.	p.m.
13	4.50	6.41	12.34	12.59
14	4.50	6.41	1.16	2.1
15	4.50	6.42	1.59	3.5
16	4.51	6.43	2.46	4.11
17	4.51	6.44	3.36	5.18
18	4.52	6.45	4.33	6.24
19	4.52	6.46	5.33	7.26
20	4.52	6.46	6.35	8.22
21	4.53	6.47	7.39	9.14
22	4.53	6.47	8.41	10.1
23	4.54	6.47	9.40	10.42
24	4.54	6.48	10.38	11.20
25	4.55	6.48	11.33	11.56
			p.m.	
26	4.55	6.49	12.26	nil
				a.m.
27	4.56	6.49	1.18	12.31
28	4.57	6.50	2.10	1.7
29	4.57	6.50	3.0	1.43
30	4.58	6.50	3.51	2.22
31	4.58	6.50	4.42	3.3

Phases of the Moon.

4th December, Full Moon, 6.51 a.m.
12th „ Last Quarter, 4.48 a.m.
18th „ New Moon, 8.18 p.m.
25th „ First Quarter, 8.48 p.m.

ITS GREATEST BRILLIANCY.

THE Evening Star—Venus—claims most of our attention this month, for about Christmas time it will shine with its greatest brilliancy—a brightness so great that no other star or planet ever approaches its splendour. About this time Venus is bright enough to cast distinct shadows upon the earth on moonless nights, in places far from city lights. Unfortunately, the moon will be nearing its full when Venus shines at its brightest. Early in the new year the altitude of the Evening Star will decrease rapidly and its glory fade as it moves in between the earth and the sun. In a small telescope, Venus now appears crescent-shaped, and each evening the crescent will become more slender until in the new year the sun will shine only on the far side of the planet and its night side will be presented earthward.

THE STAR OF BETHLEHEM.

Much has been written about the "Star" which guided the Wise men from the east to Bethlehem on the first Christmas morn. What sort of a heavenly appearance it was is not known. Was it a nova, which shone brightly for a time, and then faded, or a comet, pointing a long ethereal finger to Bethlehem, or a close conjunction of two or three planets? No one will ever know—the gospel story is too brief and vague and the narrator's object was not to teach astronomy. However, there is an ancient tradition that the "star" was none other than Venus, which shone with particular lustre at that time and would be endowed with a similar brilliancy to herald the second coming of Christ.

Every eight years Venus shines with extraordinary brightness. The last time was in 1937, when the planet was the Morning Star. In the late eighteen-nineties such a period of great brilliancy occurred, and some of the country folk in England remembered the old tradition and hailed the brilliant planet as the herald of the second coming of Christ.

On 22nd December the earth will reach that part of its orbit where the sun will reach its farthest south. On that date Old Sol will be overhead at Rockhampton, Longreach, and Emerald, and the shadow of a man will be only as large as the diameter of his belt. After that date the shadow will lengthen as the sun moves northward again.

Mars now crosses the meridian about 8 o'clock and is high in the eastern evening sky at dark. Its fiery red colour has attracted attention during the past few months. The planet was at its best, however, in October, when it was at its nearest to the earth—38 million miles.

Last month Saturn appeared at its best and nearest, it being then 756 million miles away. It is farther away now, but its dull yellow gleam may still be seen a little south of the Pleiades, which rises in the early evening. In a small telescope Saturn appears a long-shaped star; in a larger one its great flat rings are easily seen.

COULD SWALLOW 1,300 EARTHS.

The largest of all the planets is Jupiter, which is 1,300 times as large as the earth. The earth will be passing Jupiter on 8th December, when the planet will be at its nearest—nearly 400 million miles. Jupiter, being in opposition, will rise about sunset and will reach the meridian at midnight. Jupiter is the brightest "star" in the eastern evening sky—it cannot be missed—north of Orion, a little east of Aldebaran in the Hyades. The great astronomer Kepler, who, like many other astronomers, tried to probe into the mystery of the Star of Bethlehem, calculated that about the time of the birth of Christ a very close conjunction of Jupiter and Saturn took place, and they may have appeared as one large star for a short time. Last year, it will be remembered, there was a triple conjunction of these planets, when they passed close to each other no fewer than three times. Even such a rare occurrence as this, however, would not satisfy the conditions stated in St. Math. 2—our only record.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

LOOKING NORTH ABOUT 10 O'CLOCK.

On a clear, moonless night the midsummer sky presents the most magnificent constellations of brilliant stars that can be seen in any part of the heavens. At the present time three bright planets also come within the picture to add still more lustre to the brilliant scene. The beauty and wonder of a starry night has appealed to all at some time or another, whatever their station in life might be.

The stars appear somewhat higher in the sky than shown in the picture, especially north from Warwick. Starting with the Milky Way, we find near the upper edge the famous and well-known starry figure of Orion—the Mighty Hunter, who is mentioned in the most ancient writings. In common with most of the primitive star-figures, Orion is upside-down to us of the south. Therefore, his sword appears hanging upwards from his three-starred belt, which is in the centre of the four bright stars, forming an oblong, which marks his shoulders, left foot, and right knee. Behind the Giant comes his great dogs, Canis Major and Canis Minor. The great, white star near the east corner is Sirius, the Dog Star, the brightest star in the whole heavens. Across the Milky Way is Canis Minor, and its bright star is Procyon. In ancient star maps Orion is shown climbing a hill, so that his left foot is level with his right knee. In his upraised right hand he wields a mighty waddy, and on his left arm is a lion's skin which he uses as a shield. Down the hill charging upon him is Taurus, the Wild Bull. His head is shown by the Hyades, a V-shaped cluster in which is the large red star Aldebaran, the Eye of the Bull.

A little farther to the west, in the shoulder of Taurus, is the well-known little cluster of the Pleiades, or the Seven Sisters. Long ago the Pleiades were used as a natural calendar by which agricultural and other operations were carried out. In ancient writings they are always spoken of as the Seven Stars, yet, for many centuries, only six stars have been easily seen to ordinary eyes. However, keen eyes may see more. One man was credited with being able to see thirteen—perhaps he had not read the lines—

"There was a young man of Cadiz,
Who was sent directly to Hades,
For he said, any night, with his keen sight,
He could see twenty stars in the Pleiades."

The planet near the Pleiades, marked by a round dot, is Saturn, while the one between Orion and Taurus is Jupiter. On the lower edge of the Milky Way is the brilliant star Capella, one of the finest stars in the northern heavens. Farther west, on the upper edge of the Milky Way, is Algol—the Demon Star; given such a satanic name, perhaps, because of its winking. Usually it is of mag. 2, but at regular intervals of 69 hours it fades to mag. 4. This is due to a dimmer companion, which at these intervals passes between us and the brighter star.

To the west of the Pleiades are two bright stars which mark Aries—the Ram—and farther, near the edge of the picture, are the two eastern stars of the Great Square of Pegasus. Not far from the upper star is Mars. The kite-shaped group, which points up toward the west corner, and has four stars streaming from its lower end, is Cetus—the Sea Monster. The upper star of the four is the very remarkable star Mira. In June and July, Mira was about mag. 3. Since then it has faded quite out of sight. It does this trick about every eleven months, but it is very irregular in all its ways. The reason for these vagaries is quite unknown.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1941 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of years' records.	Sept., 1941.	Sept., 1940.
	In.		In.	In.
North Coast.				
Atherton	0·72	40	0·29	0·34
Cairns	1·63	59	0·43	0·38
Cardwell	1·49	69	0·80	0·49
Cooktown	0·56	65	0·17	0·83
Herberton	0·54	55	0·15	0·20
Ingham	1·52	49	0·66	0·15
Innisfail	3·48	60	1·07	1·11
Mossman Mill	1·60	28	0·22	0·63
Townsville	0·72	70	0·05	0·02
Central Coast.				
Ayr	1·24	54	0·33	Nil
Bowen	0·77	70	Nil	Nil
Charters Towers	0·76	59	0·01	0·01
Mackay P.O.	1·61	70	0·73	0·04
Mackay Sugar Experiment Station	1·38	44	0·35	0·08
Proserpine	1·95	38	0·21	0·32
St. Lawrence	1·20	70	0·13	Nil
South Coast.				
Biggenden	1·44	42	0·08	0·27
Bundaberg	1·51	58	Nil	0·55
Brisbane	1·96	89	0·48	0·75
Caboolture	1·80	65	0·38	0·63
Childers	1·68	46	0·30	0·42
Crohamhurst	2·57	48	0·55	0·42
Esk	2·00	54	Nil	0·40
South Coast—contd.				
Gatton College	1·47	42	0·11	0·59
Gayndah	1·51	70	0·07	1·11
Gympie	2·06	71	0·09	1·88
Kilkivan	1·66	60	0·18	0·96
Maryborough	1·87	70	0·10	1·39
Nambour	2·35	45	0·27	0·31
Nanango	1·76	59	0·23	0·91
Rockhampton	1·24	70	0·06	0·28
Woodford	2·09	54	0·15	1·29
Central Highlands.				
Clermont	0·97	70	Nil	0·86
Gindie	1·01	42	..	1·22
Springsure	1·25	72	Nil	0·82
Darling Downs.				
Dalby	1·64	71	0·14	1·53
Emu Vale	1·69	45	0·16	0·83
Hermitage	1·56	36	..	1·00
Jimbour	1·57	62	0·10	1·50
Miles	1·30	56	Nil	0·92
Stanthorpe	2·24	68	0·11	1·09
Toowoomba	2·05	69	0·26	0·96
Warwick	1·79	76	0·09	1·22
Maranoa.				
Bungeworgorai	0·88	27	..	0·27
Roma	1·36	67	0·04	0·35

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1941.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means.		Shade Temperature. Extremes.				Rainfall.	
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	..	79	69	82	28	61	7	17	1
Herberton	..	76	52	86	30	37	6	15	2
Rockhampton	30·11	84	58	91	30	46	13	6	4
Brisbane	30·11	77	56	90·1	5	47	13	48	4
Darling Downs.									
Dalby	..	81	48	90	22	32	14	14	1
Stanthorpe	..	73	38	83	21, 22	26·1	13	11	2
Toowoomba	..	74	49	83	23	40	13	26	2
Mid-Interior.									
Georgetown	30·03	91	59	96	29	49	12	Nil	..
Longreach	30·08	88	52	95	26, 27	39	12	Nil	..
Mitchell	30·08	92	43	93	21, 22	30	13	3	..
Western.									
Burketown	..	86	62	98	30	55	12	Nil	..
Boulia	30·03	87	55	100	22	44	12, 14	Nil	..
Thargomindah	30·05	82	52	97	21	40	13, 17	Nil	..

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling, members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

Vol. LVI. 1 DECEMBER, 1941 Part 6

Event and Comment

Farming as a Way of Life.

BY its very nature the agricultural problem is just as much an urban problem as it is a rural problem, and there is far more in it than a question of cheap and plentiful food supplies.

In its highest expression farming is a way of life, although we cannot get away from the fact that farming is a business as well. A right relationship to the land brings with it right human relationship —the natural relationship of people engaged in the same job, who know the job and have a job worth knowing. In farming, when regarded as a way of life, there is wisdom and contentment. Such contentment, however, is often mistaken by unthinking townsmen for slowness in the uptake, but farmers know from experience that "the mills of God grind slowly and they grind exceeding small." A lot is heard about the innate conservatism of the farmer and his dislike for regimentation. Well, there is nothing much wrong with that, and there is a lot to be said for independence of thought, independence of outlook, and independence of action when it is the right sort of action and in conformity with social needs, duties, and responsibilities. Regarded broadly, the farmer's mental conservatism, as it is called, is wholly natural and fundamentally sound. It comes from an attitude of mind which is absorbed rather than consciously acquired by people who live in constant contact with living things. Farmers know that the behaviour of living things, whether plants or animals, does not

necessarily conform to the ideas of theorists, and that nature will not be speeded up. They know from experience that their business cannot, of its very character, accommodate itself to rapidly changing conditions. They know that nothing can alter the facts that most crops and small farm animals take a big part of a year to come to maturity; that the growth of larger animals takes several years; that the building up of a herd takes many years; a fruit tree may have a life of very many years; and the building up of the condition of the soil, which is the foundation of everything, can never be said to be finished. The characteristics of a valuable flock or herd cannot be altered, and altered back again to suit the capricious demands of a fluctuating market. A farmer has to think and plan ahead, not for a month or a year but possibly for two to five or even ten years; all the time balancing every factor—weather and general seasonal conditions, pasture, cultivation, livestock, fertilizing, and man-power; and watching growth and planning for improvement—yet, not only thinking and watching, but working strenuously and making quick decisions all the time. Truly a man's job, but one that can be easily spoilt by chopping and changing what should be settled policy.

So farmers naturally do not take too kindly to any form of interference based on purely theoretical considerations. They know that farming cannot be treated as merely "a mixture of chemistry and cost accountancy." They know that nature will not be driven and that if you try she hits back—slowly, perhaps, but very, very hard.

Farmers have a reputation for individualism and independence. These are sound qualities compatible with the highest forms of social organisation—in fact, they give it undoubted value, for when individualism and independence are the characteristics of the members of an organisation they put the stamp of quality on a whole organisation. "Nothing can grow downwards from the top."

Farming certainly calls for a high degree of skill and as much, if not more intelligence than most town occupations. Farming is more than an industry, it is an art and a craft and at its highest it is a way of life.

Agriculture in Practice.

WAR-TIME farming in Britain has brought out the soundness of many of the old maxims which guided our forefathers in the right use of the land. Those old producers may not have had any scientific training, but they had plenty of common sense. And if science may still be defined as organised common sense—well, they had plenty of science, too.

The checking of soil exhaustion and the maintenance of balance in the soil especially are practices which are bearing the test of the intense cultivation necessary for the war-time feeding of the people. The problem of maintaining humus and soil fertility under modern systems of farming and the extent to which chemical fertilizers can make up for organic manures is a subject in which there are still differences of opinion. Taking the common-sense view, however, in absence of humus or vegetable matter in the soil, overdoses of chemical or mineral fertilizers may contribute to soil exhaustion without our knowing it.

That was demonstrated in New Zealand—which has probably the finest and least adulterated pastures in the world—by excessive dressings of nitrogenous fertilizers in areas suffering from serious phosphatic starvation.

In the Old Country it has been found that, although less fertilizer is used by the average small farmer there than in other countries, much money is wasted by those who can least afford it under the impression that the same medicine, provided by the chemist, is applicable to all soil and plant requirements.

One very important thing is emerging from war-time experience in Britain, and that is "the need for more comprehensive planning of the nation's agriculture and the nation's needs, and a more economic system of using available implements and labour over larger areas than existing farm units."

Other teachings of war-time experience are that "the least skilled man on a farm needs more wit than the so-called unskilled labourers of other industries." It is also advocated that financial assistance should "go to the good farmers who feed the land, as tradition says it should be fed, and none should go to those who merely exploit the land." That is how one acknowledged agricultural authority has put it and he goes on to say: "We are surrounded by a world of nonsense, built out of pieces of sense, put together wrongly. This nonsense world has too much chemistry, forgetting the living earth."

Perhaps he is right. Looking at it another way, many of us try to obtain health from a medicine bottle or a pill box when our common sense tells us we should maintain fitness by eating the right sort of food in the right proportion at the right time, and also taking the right sort of physical exercise at the right time. The same thing, it seems, applies largely to our soil in crop production.

When the War is Over.

THERE is a lot of talk these days about what should be done to meet the problems which are sure to develop when the war ends. Plainly, the first thing to be done is to clarify the general principles of reconstruction and think hard about those principles before going on with the planning. There is already a strong feeling against the repetition of the mistakes made after the last war when thinking came after the planning, or rather lack of planning. The immediate urgency is the preparation of plans for the post-war period, so that when peace does come nothing of real importance shall have been left undone. Vision of possibilities should be reinforced with a determination to make the best of the opportunities which peace will bring, and that will ensure steadiness in the time of ordeal yet to come and a stimulus to co-operate in the work of rebuilding with something of the unity and energy at present displayed in the national war effort.

Tremendous demands are sure to be made on what has been called "the intelligent use of our resources on scientific lines"—in other words, the lines of common sense. Among other obvious things to be considered are the interlocking of rural and other industries and food production policy and nutrition. After all, national planning is a vital part of the national war effort and one of the ways in which we can make "democracy not only something to fight for, but something to fight with."

What are required are foresight, constructive imagination, clear thinking, and sound planning in preparation for the new problems and the new opportunities which are certain to arise when the war is over.

The Sorghum Midge.

D. O. ATHERTON, M.Sc., Research Officer.

DURING recent years there has been a rapid expansion of the area sown to grain sorghums in districts with an annual rainfall of 20 to 30 inches, such as the Darling Downs, Maranoa, Upper Burnett, Dawson Valley, and similar parts of south-eastern and central Queensland. Yields have, however, been appreciably reduced in some areas by a very small fly known as the sorghum midge*. This insect was first found in Queensland during 1928, but may have been present for some years previously. It was originally described from Texas, in the United States of America, in 1898, but is said to have been introduced into that country from Southern Asia. The insect has now been recorded in most of the countries where fodder and grain crops of the genus *Sorghum* are grown. In Queensland, the injury is most important and obvious in the grain sorghums, but other crops, such as broom millet, Sudan grass, and saccharine sorghums, are also attacked. The notorious weed, Johnson grass, is also a host in Queensland, but as yet there is no evidence that native grasses are attacked, though hosts outside the genus *Sorghum* are reported from other countries.

Injury.

Many farmers have suffered crop damage from sorghum midge without realising the cause of their losses. When a well-grown grain sorghum crop shows a large percentage of sterile or partially sterile heads, it is likely that the sorghum midge has been active. Damage by this pest is confined to the young seeds developing in the head and no other part of the plant is affected in any way. The effects of severe infestation are very similar in appearance to frost damage in a late planted crop, but may readily be distinguished from the latter on close examination. When a sorghum crop has been frosted, none of the seeds develop into mature grain, but even in a heavily midge-infested crop one or more grains usually occur on otherwise sterile heads (Plate 158). Injury is usually more severe in late maturing crops than in those which mature early and, in varieties whose tillers mature some weeks later than the central head, the damage is principally in the tillers.

Life History.

The sorghum midge passes through the usual developmental stages —egg, larva, pupa, and adult. The adult (Plate 159; figs. 4 and 5) is a very small fly about one-twelfth of an inch long with relatively long antennæ, orange abdomen, dusky thorax, and transparent wings. The female is slightly larger than the male and bears a well-developed ovipositor at the tip of the abdomen. The midge may be seen swarming about the heads of any heavily infested crop during the summer, particularly on a sunny morning. The female lives only a day or two after emergence in the summer, but even in so short a life it lays about 100 eggs; the male probably survives not more than a few hours.

The extremely small, white elongate eggs (Plate 159; fig. 1) are laid singly between the glumes of the flower shortly after it opens. From the egg, which has an incubation period of about two days in

---

* *Contarinia sorghicola* Coq.

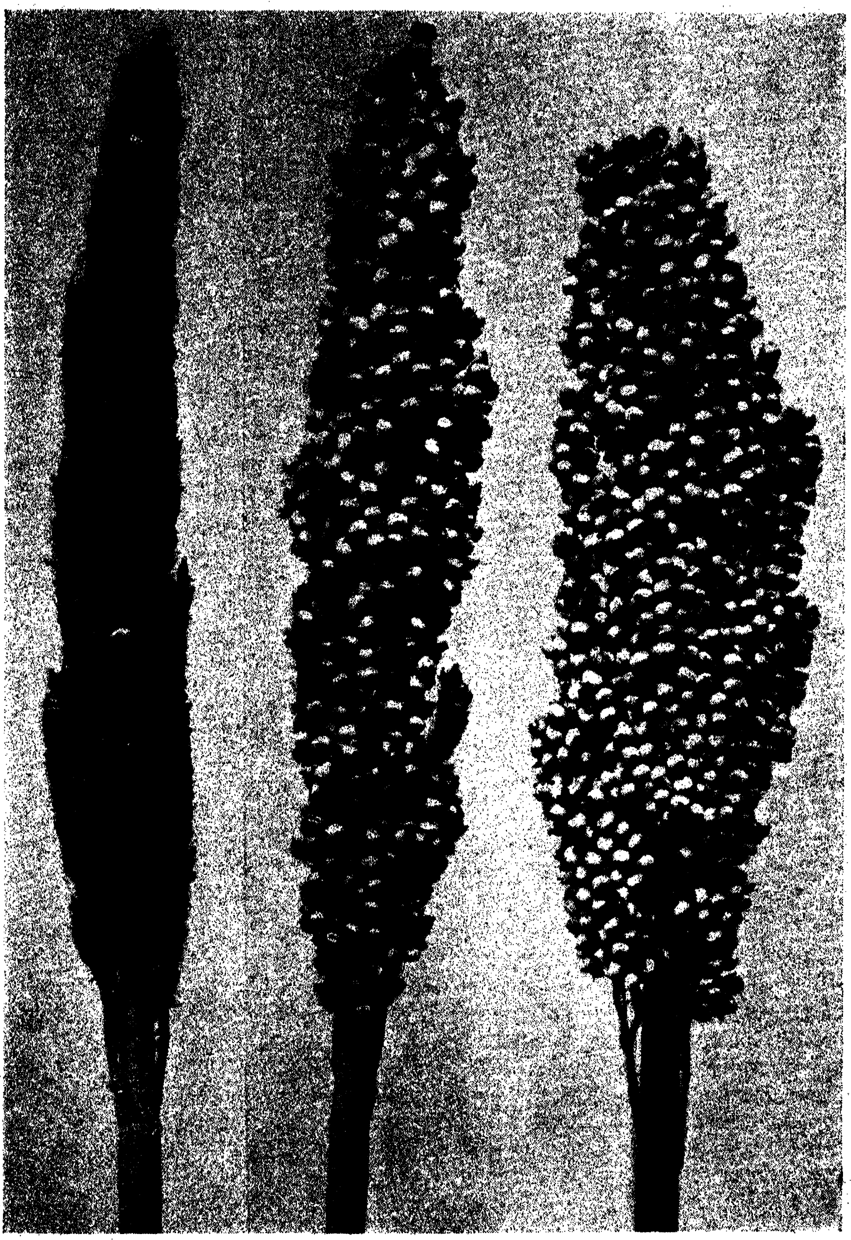


Fig. 1. Fig. 2. Fig. 3.

Plate 158.

SORGHUM HEADS INJURED BY MIDGE—Fig. 1.—Severely infested head with few grains; fig. 2—moderately infested head with about one-third of the grains developed: fig. 3—normal head with almost all the grains developed.

summer, a very small, white, legless larva (Plate 159; fig. 2) emerges and commences to feed on the young seed. Several larvæ may occur in a single flower, and the injury is such that the seed fails to develop. The larva is full-grown in a week or ten days after it emerges from the egg and is then orange-red in colour and about one-twelfth of an inch long. The full-grown larva may or may not spin a very delicate cocoon before changing into the pupa (Plate 159; fig. 3). The latter, when first formed, is nearly one-sixteenth of an inch long and uniformly reddish-orange in colour, but within a day or two the head and appendages turn dark-brown or nearly black. The pupal stage lasts about three days in summer, and by that time the pupa has moved up the now sterile flower until it protrudes from the tips of the glumes (Plate 159; fig. 7). Here the adult fly emerges and development is complete, the whole life-cycle having occupied from twelve to fifteen days. At the onset of winter, the full-grown larvæ spin flimsy cocoons and development ceases until spring, when most of the over-wintering larvæ pupate and later emerge as adults, which begin the first spring generation. A few hibernate right through the summer, however, and do not emerge until the following spring, about eighteen months after reaching full size.

When the adults emerge in the spring they are comparatively few in number, but as females can lay about 100 eggs each and the time required for a summer generation is only a fortnight, a very rapid increase in the midge population occurs early in the season wherever host plants are continuously available in the flowering stage.

Natural Enemies.

Small insectivorous birds take their toll of these, as of other insects, and enormous numbers of the pest can be found securely caught in spider webs spun about the seed heads in an infested field. Ants also destroy numbers of larvæ and pupæ. At least two very small wasps are parasitic on the larval or pupal stages of the sorghum midge in south-eastern Queensland. Sometimes these wasps are abundant, but they are far from being sufficiently effective to control the pest.

Control.

The economic loss caused by the sorghum midge is almost entirely confined to grain sorghums, though the reduction of yield in related fodder crops grown for seed may be serious at times. Obviously a fodder crop still has fair value even though the grain is destroyed, while broom millet loses little of its value even though many of the flowers are sterile. Consequently, control recommendations are concerned almost exclusively with the protection of grain sorghum crops; any reference to other hosts is incidental and due to their influence on the yield of grain sorghums.

Owing to the breeding habits of the pest, it would be extremely difficult to apply an insecticide effectively, quite apart from the prohibitive expense of using any such direct control measures on a field crop.

DESCRIPTION OF PLATE 159.

SORGHUM MIDGE.—Fig. 1—Egg x 200; fig. 2—half-grown larva x 25; fig. 3—pupa x 25; fig. 4—female, side view x 25; fig. 5—male, top view x 25; fig. 6—part of damaged head showing odd sound grains x 7; fig. 7—tip of flower, showing cast pupal skin x 25.

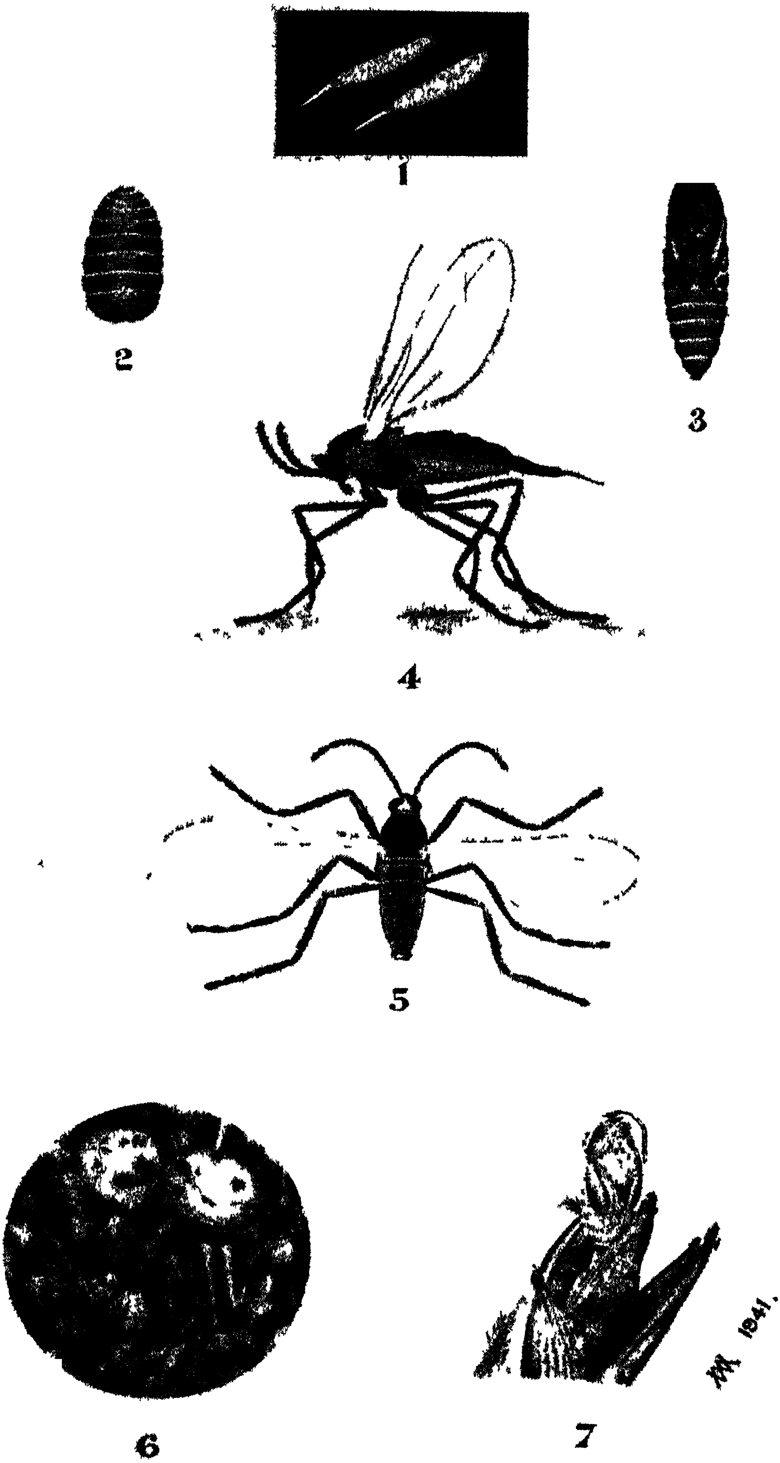


Plate 159.
SORGHUM MIDGE.

Consequently, the losses caused by midge can only be reduced by cultural operations and cropping practices, which tend to keep the midge population at low levels when the crop is in the flowering stage.

For all practical purposes the list of host plants in Queensland can be restricted to grain sorghums, saccharine sorghums, broom millet, Sudan grass, and Johnson grass. Johnson grass is normally regarded as a dangerous weed, and the fact that it is an alternative host for sorghum midge is but one more reason for its eradication. If eradication is not practicable, at least it should not be allowed to flower earlier than near-by crops of grain sorghums.

Sudan grass and saccharine sorghums are very important summer fodder crops in the Queensland districts climatically suitable for grain sorghum production. The acreage under broom millet is small and the varieties grown are late-maturing; hence this crop is not likely to have much effect on infestation in grain sorghums. The cultural and cropping problem is therefore a question of devising a farming system by which saccharine sorghums, Sudan grass, and grain sorghums can all be grown in more or less close proximity without midge losses in the grain sorghums becoming excessive.

To ensure this, Sudan grass must be handled so that the flower heads produced by it are not left in the field long enough to breed out a generation of midges before the grain sorghum flowers. Sudan grass is normally planted with the early spring rains. It may therefore flower some weeks before the later planted grain sorghum. If this is likely to happen, the crop should be cut for hay a week after flowering begins. Sudan grass hay made from a non-flowering crop may be as dangerous to stock as the grass itself would be if grazed at the same stage of growth. Bulk may be lost by so haying the crop, but any loss of this kind will be negligible compared with that which can be expected in the grain sorghums if this precaution is omitted. Saccharine sorghums usually take longer to mature than grain sorghums and, if planted after the latter, they should not accentuate the midge infestation in the grain crop.

In areas where the sorghum midge is common, the yield depends largely on the tillering habit of the variety grown. Varieties which carry the greater part of the crop on the central heads, or, alternatively, mature their tillers at about the same time as the central head, generally suffer least. Hegari and Kalo are credited with these characteristics. Whatever variety is grown, however, the seed must be true to type, or irregular flowering will create conditions favourable for midge infestation.

Early planting will reduce losses, for the crop then heads before the sorghum midge population becomes high in late summer and autumn. Early planting is, however, seldom practicable because the labour resources of the farm are usually needed for preparing the land and sowing fodder crops such as Sudan grass, white panicum, and Japanese millet when spring rains occur. There is a further difficulty, too, in the fact that early planted grain sorghum crops will mature during summer when harvesting is apt to be difficult owing to wet weather. Planting should, therefore, be arranged so far as is possible to mature the crop by the end of March. The precise time of planting will depend on the incidence of rains during November and December and the growing

period of the variety to be sown. Of the better-known varieties, Wheatland Milo is somewhat slower to mature than Kalo or Hegari, and should be planted earlier.

As the pest over-winters on the remnants of grain sorghum, saccharine sorghum, and Sudan grass crops, all paddocks should be cleaned up by mid-September in each year. This may be done by ploughing alone or, preferably, by ploughing after the old plants have first been raked up and burned. Large numbers of the midge will then be destroyed.

To sum up, control measures should be based on the reasonably well-established fact that midge damage on the farm is directly correlated with the management of crops in the *Sorghum* group. The farmer must, therefore (*a*) destroy all residues of grain and fodder sorghums by mid-September; (*b*) sow saccharine sorghums after the grain sorghum crop has been planted; (*c*) cut and hay any Sudan grass a week after flowering begins should there be any likelihood of its heading before the grain sorghum; (*d*) sow only one true-to-type variety of grain sorghum in a single planting so that it will mature towards the end of the wet season.

POTATO SEED TREATMENT.

Two methods are available for disinfecting seed potatoes—hot formalin solution; and acid corrosive sublimate. The latter is more convenient, as no heating is required. The potatoes should be washed but not cut before treating.

Hot Formalin.—Prepare a formalin solution by mixing 1 pint of commercial formalin (40 per cent. formaldehyde) with 15 gallons of water. Heat to 125 deg. Fahr. and arrange for maintaining the temperature at this point by building a small fire under the tank or by keeping some of the solution hot in a boiler so that a little of this may be added from time to time as the rest cools. No more than a 5 deg. variation in temperature either way during the operation should be allowed. Dip the seed tubers into the solution for two and a-half minutes in successive small quantities in crates or open sacks. Remove, and after draining excess solution back into the tank, cover the potatoes with bags or canvas for one hour to keep in the formalin fumes. Finally spread out to dry before planting.

Acid Corrosive Sublimate.—Add ¼ lb. of corrosive sublimate and 1¼ lb. of hydrochloric acid (spirits of salts) to 12½ gallons of water. A wooden or well-painted vessel must be used, as this mixtures corrodes metal. When all the corrosive sublimate has dissolved, immerse the tubers (in lots of convenient size) for five minutes, and then spread out to dry thoroughly. The dipping is preferably carried out in wooden crates rather than bags. The solution loses its strength gradually, so that a fresh quantity should be made up after not more than ten successive lots have been treated.

Acid corrosive sublimate is best applied to the seed at least three months before use or, if this is not possible, then immediately prior to planting. Otherwise some injury or delay in germination may occur. Corrosive sublimate is a deadly poison and must be used with care. All treated tubers must be planted or buried to avoid the possibility of their being consumed by any person or domestic animal. The solution may cause some irritation to the hands unless they are greased well before immersion.

These treatments are only effective if the soil on which the crop is grown is free from the parasitic fungi concerned. It is of little use treating seed to be planted in land which has borne a badly-diseased crop of potatoes within recent years.

The Avocado in Queensland.

R. L. PREST, Instructor in Fruit Culture.

THE avocado has for many years been a staple diet of the natives of Central and South America and the West Indies. From there it was introduced to the United States of America, where it is now extensively produced. Because of its highly nutritious qualities, it has been called "the fruit sensation of modern agriculture." The fruits of some varieties are pear-shaped, and because of this it is sometimes referred to as avocado pear. Its only resemblance to a pear, however, is the shape of some varieties. The fleshy edible portion inside the skin of the fruit may be upwards of an inch in thickness, and normally surrounds a single large seed. When ripe, the flesh is of the consistency and colour of butter and possesses a rich nutty flavour. The best varieties have a very high fat content—an average of 20 per cent. Because of its rich fat content, the avocado is not at first agreeable to all palates and is therefore often classed as a fruit for which a taste must be cultivated. Once having acquired the taste, however, people have been known to pay very high prices for the fruit. It may be eaten fresh or with the addition of pepper, salt, or vinegar, while it is a tasty addition to green vegetable salads.

In Queensland, in the commercial sense, it is a comparatively new fruit. The history of its introduction is somewhat obscure, but records indicate that the earlier introductions were planted as seedlings about thirty years ago. Many of these trees are still fruiting.

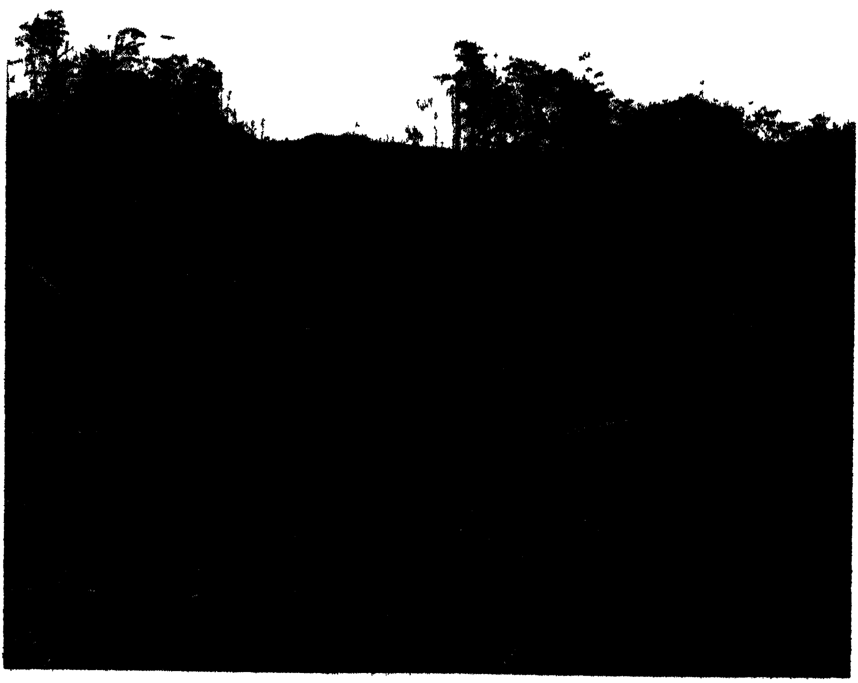


Plate 160.
A SMALL SOUTH COAST FOOTHILLS PLANTATION.

Observations show that avocados may be grown successfully on good soils along practically the whole of the Queensland seaboard. Trees planted in the foothill districts along the North and South Coasts and in North Queensland have grown vigorously and some are now in heavy bearing. These trees were mainly grown from seed introduced from time to time by the Department of Agriculture and Stock and the Queensland Acclimatisation Society. In recent years, budwood and grafted trees of promising varieties have also been imported from the United States by private individuals, while selections have been made of several locally-raised seedlings of excellent quality.

In the course of the past three years, investigations into the many angles of avocado-growing have been conducted, and though they are incomplete some valuable information has been compiled which will be of interest and value, not only to intending planters, but to orchardists already established.

In view of the fact that seedling avocados cannot be relied on to produce fruit true to type, and also because of the desirability of only planting trees of merit, it is considered advisable to indicate the direction in which improvement can be effected as the information is collated.

Plate 161.

YOUNG AVOCADO TREE, "NABAL."

Botanical Status.

Botanically the avocado belongs to the genus *Persea*, and is a member of the laurel family. The home of the cultivated species of the genus is generally conceded to be Central and South America.

Plate 162.

"NABAL" AVOCADO FRUITING.

The early classification of the avocado grouped all varieties in one species, *Persea americana.* Later studies, however, have resulted in the making of two distinct species, *P. americana* and *P. drymifolia. P. americana* includes all varieties horticulturally grouped in the Guatemalan and West Indian races, and *P. drymifolia* those of the Mexican race.

Guatemalan Race.—The fruit of this group matures during winter and spring and possesses a woody granular skin of comparative thickness.

West Indian Race.—The fruit of varieties belonging to this group is summer and autumn maturing; is medium to large in size; the skin is of medium thickness and of a leathery texture.

Mexican Race.—In these varieties also, the fruit ripens during the summer and autmn; it is small to medium in size and thin skinned. The strong aniseed aroma given off by the crushed leaves is commonly used for identifying the members of this group.

The avocado is an evergreen, though some varieties are virtually leafless for a short period during blossoming. The habit of growth is variable, some trees being tall, upright, and unbranched, while others are small, well-branched, and spreading. The leaves also vary considerably in size and shape. Young foliage often exhibits various shades of red and bronze, but when mature it is usually a bright green in colour.

Plate 163.
"FUERTE" TREE.—Note straggling type growth.

The flowers are borne in terminal clusters; they are small, and pale-green or yellowish in colour. Each flower is perfect, having male and female organs. Differentiation between calyx and corolla does not occur; the petal-like structures are in reality perianth lobes. There are nine stamens arranged in series of three, and near their base are orange-coloured glands which secrete nectar. The anthers have four cells and are opened by means of small lids or valves which are hinged at the upper end. The ovary is one-celled with a single ovule. The style is slender and hairy, whilst the stigma has only one lobe.

The fruits of different varieties vary greatly in size, shape, and colour. In shape they may be round, oval, pear-shaped, or any gradations between these forms. The colour may be light yellow, green, dark-green, maroon, purple to purplish-black.

Soils.

In Queensland, the avocado is thriving on a comparatively wide range of soils. Loams, sandy loams, and sandy soils are all regarded as suitable.

In considering the question of soils, although chemical properties are of importance, suitability largely depends on the physical properties, such as porosity and aeration on which depend good drainage; good depth also is important. Some of the loams of basaltic origin on the coastal ranges and the sandy loams along the foothills of these are excellent soils for avocados. The more sandy soils, reddish to brown in

colour, occurring in the North and South Coast districts vary in physical properties. They are often too well-drained, especially where they immediately overlie a subsoil of gravelly wash and, unless they can be well irrigated, are often unsuitable for fruitgrowing generally. Where the subsoil at 18 to 30 inches deep is of a heavier nature and a deep red in colour, the soils are often good fruitgrowing soils.

Heavy clay soils and the grey sands found in low-lying areas should be avoided.

The ideal soil for avocados is a loam of medium texture overlying a medium but porous subsoil which, in turn, overlies a gravelly wash. In no circumstances should trees be planted on poorly-drained soils, as the roots are extremely sensitive and quickly succumb to "wet feet."

Plate 164.

"BENIK."

Climatic Conditions.

As the avocado is a subtropical fruit, its commercial culture must necessarily be confined to tropical and subtropical regions. Generally, it is conceded that avocado and citrus trees have a similar range of climatic adaptation. This, however, should only be taken as a very general guide, for in practice it has been observed that the avocado is more susceptible to low winter temperatures; and, in addition, during the blossoming period, variable weather conditions, such as changes from fine to wet or warm to raw and cold, considerably interfere with the

normal floral cycle. The chief climatic factors limiting the commercial culture of the avocado in southern Queensland appear to be—

(*a*) Low winter temperatures;

(*b*) High spring and summer temperatures;

(*c*) Low atmospheric humidity during the blossoming and fruit-setting period;

(*d*) Heavy winds.

Plate 165.

Avocado Tree in Blossom.

Location.

In selecting the site for an avocado orchard, aspect should be carefully considered. Avocados thrive best in frost-free, well-sheltered, warm situations. Where winds are likely to interfere with normal tree growth, belts of standing timber should be retained for protection; while in districts denuded of the natural timbers, shelter belts should be planted.

The site should be an area of unbroken, nearly level, or gently sloping land. Steep hillsides should be avoided, for, in addition to the risk of irreparable losses by soil erosion, the costs of cultivation are materially increased.

Where hillside orchards are contemplated, contour planting should be undertaken. In this method of planting the contour grading will vary from 1 to 3 per cent., according to the length of the tree rows.

Plate 166.
AVOCADO TREE IN BLOSSOM.

Pollination.

Studies of avocado blossom behaviour in Queensland has adduced evidence similar to that obtained in other avocado-growing countries, and suggests that mixed plantings of certain varieties of different groups are essential to ensure satisfactory cross pollination. These blossom studies have demonstrated that avocado flowers have two distinct opening periods, one during the morning and one during the afternoon; and all varieties observed can, as regards flower-opening periods, be grouped into two classes which, for convenient reference, have been designated groups "A" and "B."

At the first opening of the flowers, all the stamens are spread out in a nearly flat plane (Plate 167) and the stigma is then receptive. On the second opening the inner whorl of stamens, three in number, are folded about the style (Plate 168). The outer whorl of stamens (six) do not open as widely as at their first opening, and do not fold inwards until the pollen has been discharged and the flower is about to close. The time of discharging is indicated by the opening of small lids or valves on the anthers. On the second opening of the flowers, the style appears to have elongated and the stigma is elevated above the anthers. The pollen appears as a sticky mass.

Observations have shown that the flowers of varieties in group A (page 457) open for the first time in the morning when they are receptive. They close usually between noon and 2 p.m. and open a second time during the afternoon of the following day, when they shed pollen. On occasions, a part of the third day may be required to

Plate 167.

Avocado Blossom.—First opening period (receptive). Note that stamens are spread out in a flat plane.

Plate 168.

Avocado Blossom.—Second period opening (pollen shedding). Note in whorl stamens folded about style, also small anther lids opened signifying the discharge of pollen.

complete the cycle. The flowers of varieties in Group B open for the first time in the afternoon when they are receptive, and open a second time the following morning when they shed pollen.

Sudden changes of weather conditions from fine to wet, raw, or cold upset the normal floral cycle, delaying the flower opening, and restraining the regular functioning of the floral parts. Sometimes up to eighty hours are required to complete a cycle in both "A" and "B" groups.

As has been stated, all the varieties so far studied fall into these two groups ("A" and "B"), shedding their pollen for the most part at different hours of the day; and from this it is probable that varieties selected from these two groups and interplanted will enhance the opportunities for fruit-setting.

So far, the undermentioned varieties growing in Queensland have been studied and placed in the groups "A" and "B":—

Group "A".		Group "B".	
Anaheim ..	.. G.	Campbelli	.. H.
Benik ..	.. G.	Fuerte ..	.. H.
Dickinson	.. G.	Ganter ..	.. M.
Karlsbad ..	.. G.	Nabal ..	.. G
Mayapan ..	.. G.	Northropp	.. M.
Princess ..	.. G.	Panchoy ..	.. G.
Puebla ..	.. M.	Queen ..	.. G.
Spinks ..	.. G.	Tamborine 68	.. G.
		W.P.I. ..	.. M.

The letter following the varieties denotes the race: G. Guatemalan, M. Mexican, and H. those considered to be of Hybrid origin.

Varieties.

In selecting varieties for trial plantings, some of the desirable characteristics to be considered are:—

(1) Hardy and vigorous-growing trees.
(2) Regular and heavy croppers.
(3) Uniformity in size and shape of fruit.
(4) Quality of fruit which should be fleshy, free from fibre, and of a rich nutty flavour.
(5) Seeds should be small and tight in the cavity.
(6) Thickness of skin. A thick skin is desirable, although it makes maturity more difficult to determine. Early thin-skinned varieties are susceptible to damage by fruit fly.
(7) Synchronisation of blossom periods of the varieties planted.

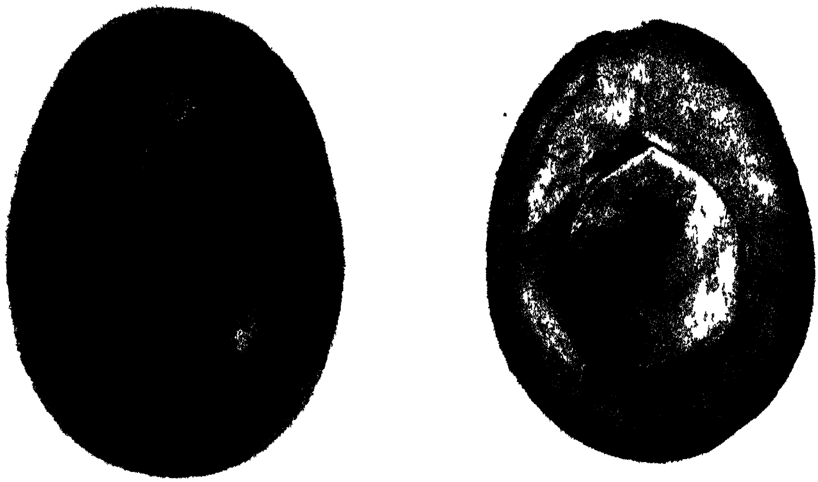


Plate 169.
ANAHEIM.

Plate 170.
BENIK.

The study of varieties is as yet far from complete, and it is quite possible that at a later stage new names will be added to the foregoing list and some may have to be removed. The varieties named and now described have all shown evidence of being sound commercial fruit. In these descriptions allowances should be made for normal variation in the fruits and the season of maturing, which will differ to some extent in different localities.

Anaheim (Guatemalan).—Tree tall with upright growth, blossoms midseason September to October, a prolific bearer, though the fruit is easily shed; fruit elliptical; skin rough, glossy, green; flesh creamy; flavour good; seed medium size and tight in cavity; matures during July and August; pollination group "A".

Benik (Guatemalan).—Tree spreading, well branched; blossoms midseason September and October. Fruit pear-shaped; skin inclined to be rough, maroon purple; flesh creamy-yellow; flavour good, quality excellent; seed small and tight in cavity; matures September to October; pollination group "A".

Dickinson (Guatemalan).—Tree well branched, spreading, blossoms midseason September and October; fruit oval to pear-shaped, apex rounded, surface roughish; purple; skin thick; flesh buttery, pale yellow, pleasant flavour, quality good; seed roundish flattened at the poles, tight in cavity; matures September and October; pollination group "A".

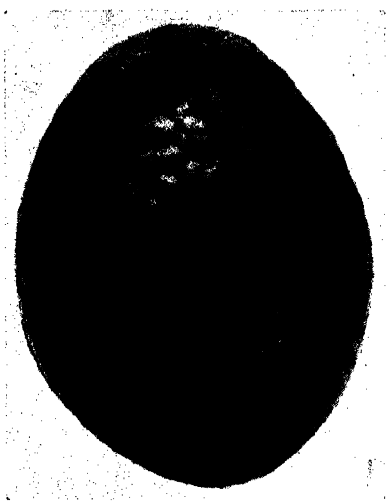


Plate 171.

DICKINSON.

D.C. 68 (Guatemalan).—A Queensland-raised seedling by Messrs. D'Arx and O'Conner, Tamborine Mountain.—Tree large, well branched, blossoms midseason; fruit pear-shaped, shiny green in colour, the skin medium, smooth granular; flesh pale yellow, buttery texture, slight fibre, flavour good; seed medium, firm in cavity; matures September; pollination group "B".

Fuerte (Hybrid).—Tree straggling, spreading; blossoms very early July and August; fruit pear-shaped, oblong, base somewhat pointed, apex obliquely flattened; green with numerous yellow dots, pebbled;

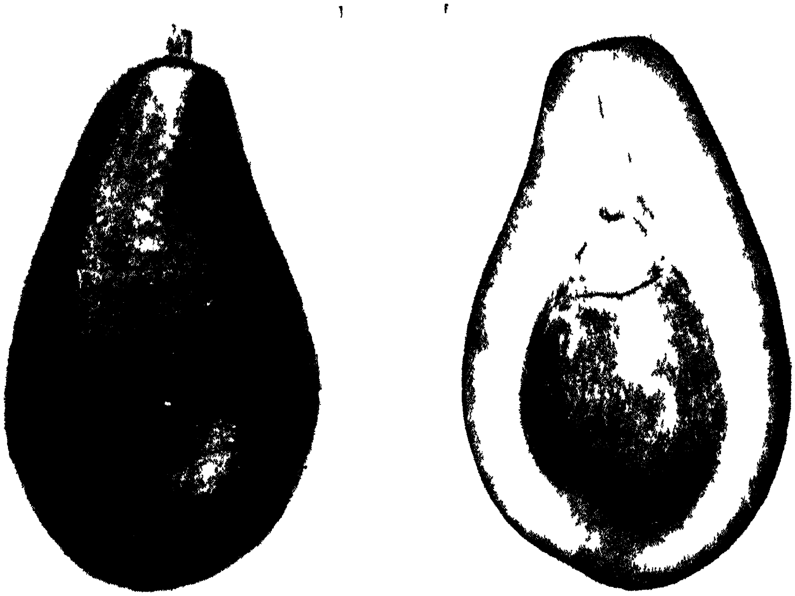


Plate 172.
CAMPBELLI

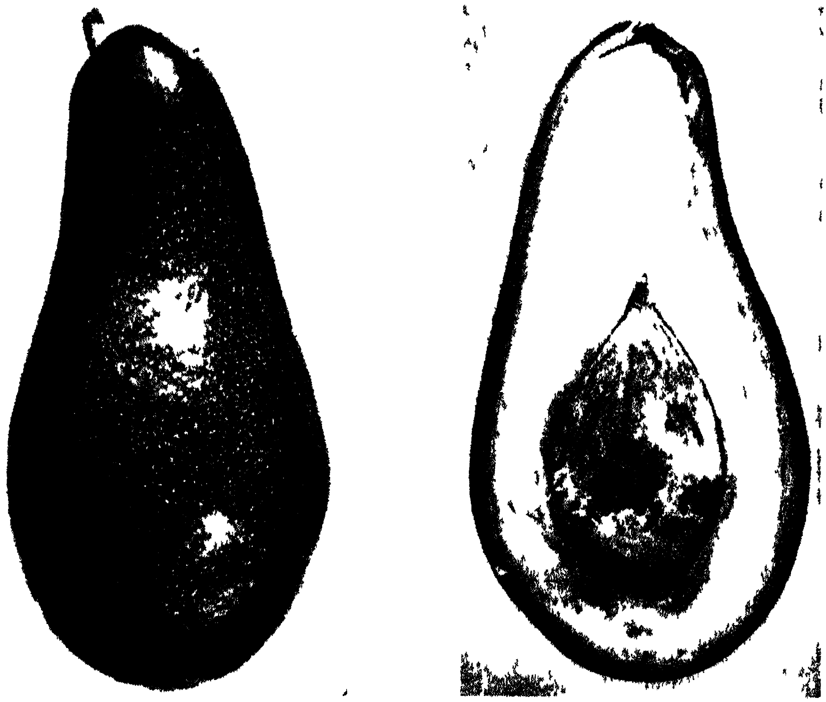


Plate 173.
D. C. SEEDLING 68.

skin thin, pliable, leathery; flesh creamy-yellow, greenish near skin, texture buttery, very rich flavour, quality excellent; seed tight in cavity; matures April and May; pollination group "B".

Plate 174.
FUERTE.

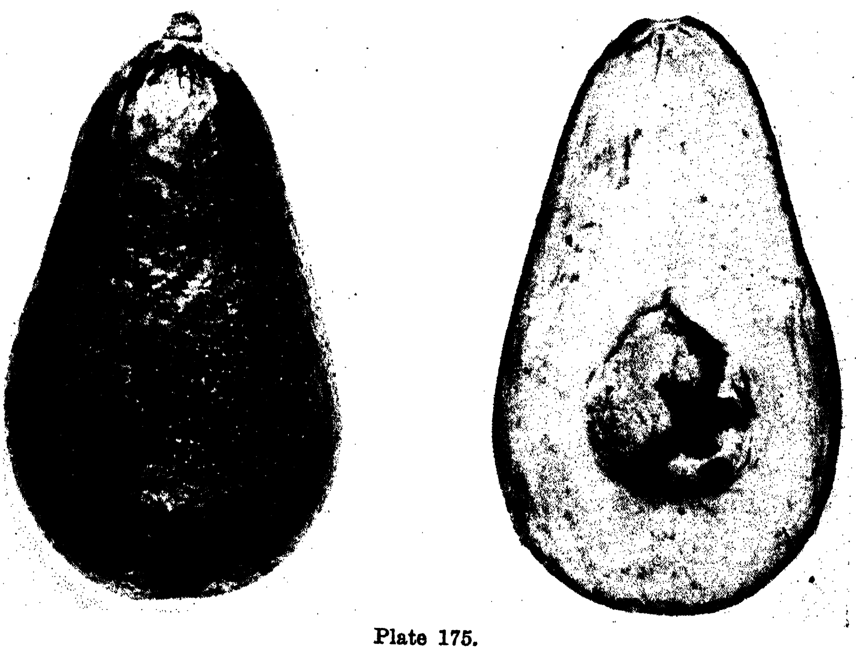


Plate 175.
KARLSBAD.

Mayapan (Guatemalan).—Tree rather upright, well branched; blossoms late October and November; fruit almost round, smooth, dark purple; skin thick, granular; flesh creamy colour, texture buttery; flavour good; seed rather large, tight in cavity; matures September and October; pollination group "A".

Nabal (Guatemalan).—Tree well branched, spreading; blossoms late October and November; fruit almost round, smooth, green in colour, skin thick granular; flesh creamy-yellow, buttery texture, greenish near skin; flavour exceptionally good; quality excellent, seed small, tight in cavity; matures October and November; pollination group "B".

Queen (Guatemalan).—Tree well branched, spreading; blossoms late October and November; fruit oblong, pear-shaped; skin rough, deep purple, thick, and woody; flesh rich yellow, greenish near the skin; flavour rich, quality good; seed small, tight in cavity; matures October; pollination group "B".

Plate 176.
MAYAPAN.

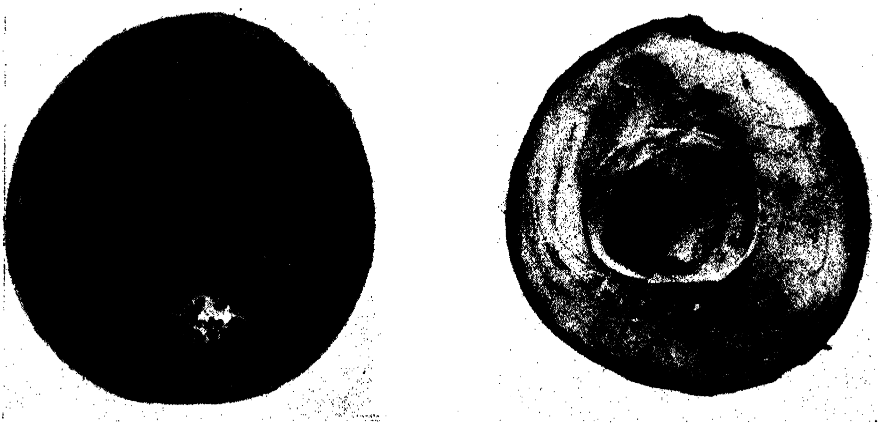
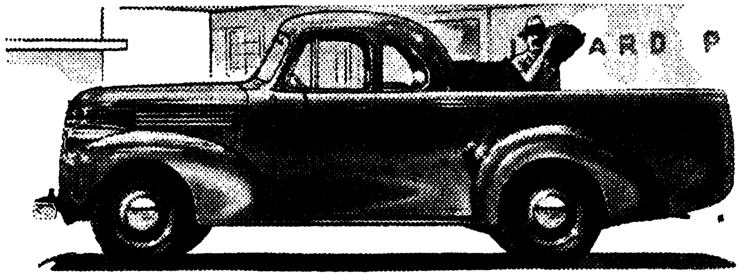


Plate 177.
NABAL.



Spinks (Guatemalan).—Tree well branched, spreading; blossoms late October and November; fruit broadly obovate; surface rough, somewhat warty at the base, dark purple; skin thick, woody, granular; flesh firm, smooth, creamy; flavour pleasant, quality good; seed large, tight in cavity; matures October and November; pollination group "A".

Wilsonia (Guatemalan).—A Queensland-raised seedling by Mr. J. Wilson, Hunchy; tree well branched, spreading; blossoms early August and September; fruit oval, dark green in colour, smooth skin, thick,

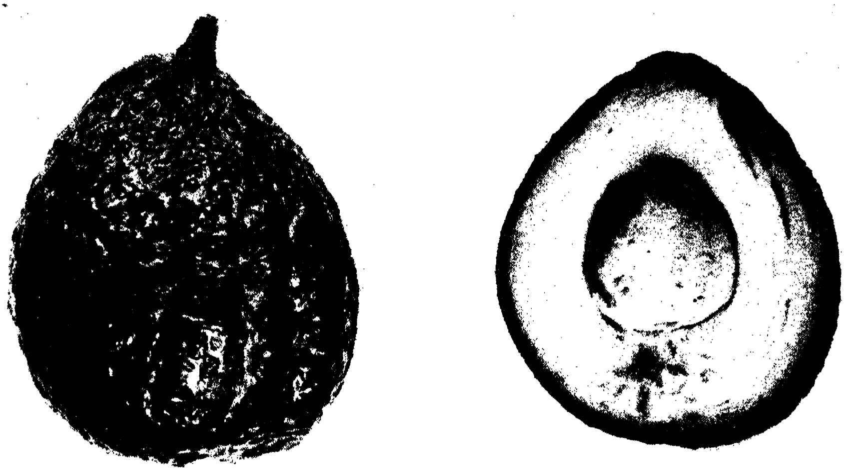


Plate 178.
SPINKS.

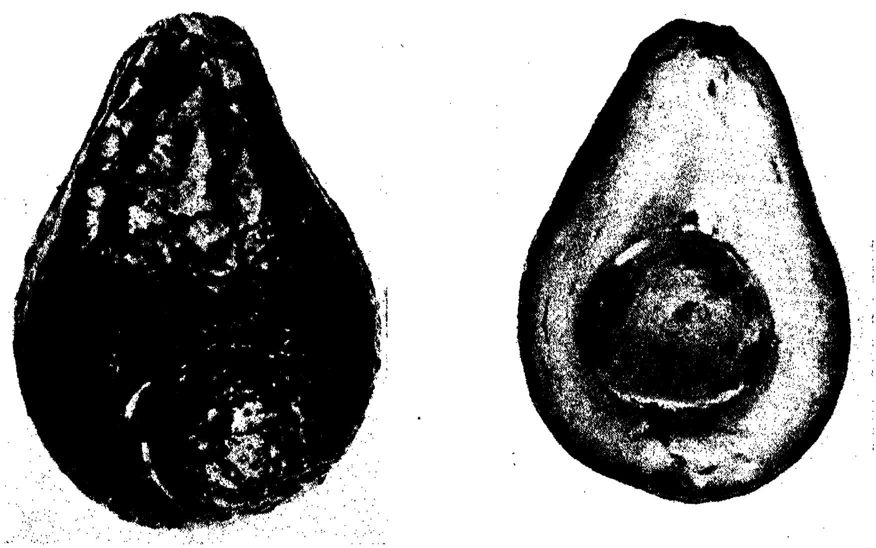


Plate 179.
QUEEN.

shell-like, granular, woody; flesh creamy coloured, greenish near skin, flavour good; seed medium large, firm in cavity; matures July and August.

W.P.I. (Mexican).—A Queensland-raised seedling; tree spreading, well branched; fruit obovoid, slightly oblique; size small to medium; surface slightly pebbled; dark green in colour; numerous yellow dots; skin particularly thin, peeling readily from the flesh; flesh firm in texture, creamy colour greenish near skin, rich nutty flavour; seed large, tight in cavity. Campbelli and Karlsbad although illustrated are not recommended at this stage.

Rootstocks.

Rootstock trials have been commenced, but the study is not sufficiently far advanced to form any conclusions or make recommendations.

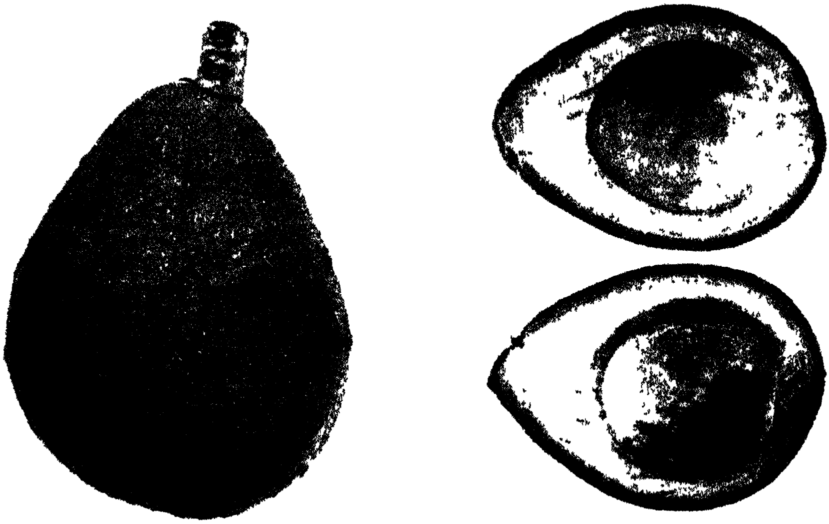


Plate 180.
W.P.I.

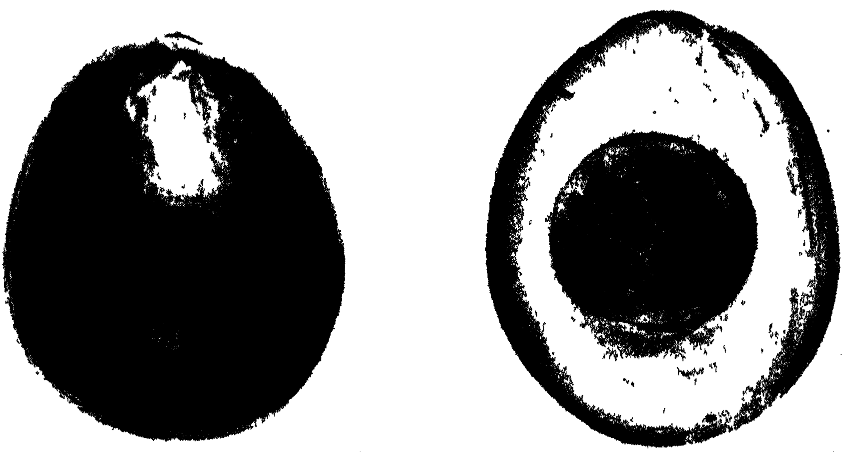


Plate 181.
WILSONIA.

It has been noted, however, that there is apparently some differences in varieties worked on Mexican rootstocks, even when the scion also is of Mexican origin. On the other hand, trees of both Mexican and Guatemalan races worked on to Guatemalan stocks generally appear to be vigorous and thrifty.

Propagation.

Raising the Seedlings.—Seeds for the propagation of avocado trees should be selected from properly matured fruits from healthy and vigorous seedlings, and should be washed, cleansed, and planted as soon as possible after removal from the fruit. They may, however, be held, if necessary, for several months without apparently impairing germination, providing care is taken to prevent them from drying out.

Germination may be induced by planting the seed in tins, seed boxes, or seed beds. A mixture of equal parts of clean sand and loam is used. The seeds are placed in the soil with the base down and with the apex just protruding above the surface. The soil should be kept moist, but not soaked. During hot weather, shading will be necessary; hessian or lath screens are useful for this purpose. Under favourable weather conditions, germination will take place within a few weeks.

When grown in a seed bed, the seedlings should be transplanted to nursery rows upon attaining a height of 6 to 8 inches. When lifting, care should be taken to prevent root damage, because avocado seedlings have a particularly long tap root.

In the nursery row, the plants are set out at 12 to 18 inches apart in the row, and the rows 30 to 36 inches apart. Immediately after planting, the seedlings should be watered to prevent wilting. Temporary protection from the sun is necessary; shading on the north-east side is particularly advisable. Frequent waterings are again necessary, but soaking should be avoided.

Budding.—When the stocks have attained a diameter of about three-eighths of an inch at their base, and the sap is flowing freely, they may be budded. In Queensland, this is usually done during autumn or spring, but it may be continued as long as the sap is flowing very freely.

Plate 182.

BUD INSERTED AND TIED.

Plate 183.

BUD SHOOT SUPPORTED BY TIE.

When the stock is ready to receive the bud, a "T" cut is made in the bark, preferably 6 to 8 inches above the ground level. The perpendicular cut should be from 1½ to 2 inches in length and just through the bark to the cambium layer in depth; damage to the cambium should be avoided. The "T" cut should be made preferably on the south side of the stock, for on that side the bud will not be exposed to the sun.

Plate 184.

BUDSTICKS.

Budwood should be carefully selected from branches of recent growth which have been permitted to mature. The terminal growth should be rejected and either of the two previous growths used. Budding avocados has been found to require rather more care than is required with some other fruits, because while the union of the stock and scion takes place readily enough, the bud often fails to grow, and the eye falls out. It is necessary, therefore, to select only the plump full buds in the middle of the bud stick. Buds at the top of the stick rarely develop, while those at the base are inclined to shed the eye. If required, budwood may be stored for from four to six weeks by packing it in trays in moist sphagnum or peat moss. Actually, storing is of advantage in so far that buds which may be over-developed are shed and the budstick may be rejected.

Before the buds are cut from the budstick the leaves should be trimmed off, leaving a piece of the leaf stalk or petiole to permit of easier handling after the bud has been cut.

The bud may be cut either from above or below, the general practice being from below the bud upwards, commencing from ¾ of an inch to 1 inch below the bud and ending from ¾ of an inch to 1 inch above it. The cut should be made with a sharp, thin-bladed knife and just deep enough to remove a thin layer of wood. Where the removal of the wood can be done without injury, the chances of a successful union are increased.

The bud is inserted in the "T" cut in the stock and gently pushed down between the bark and the cambium layer. In order to bring the bud and stock into close contact, they are then bound closely together

with raffia. About three weeks are required for the bud to unite with the stock, and during this period the tie should be inspected frequently, and where bulging appears the tie should be loosened to prevent restriction.

As soon as the union takes place, the stock may be headed back a few inches in order to force the bud into growth.

The ties should not be removed from the point of insertion until the bark flaps have entirely healed over, which should take place in from six to eight weeks after budding.

As soon as the bud has made 3 or 4 inches of growth, it should be tied to the stem of the stock and later trained to a stake. The final removal of the stock stub may be done when the bud shoot has reached 12 to 18 inches in length and has become somewhat hardened and capable of remaining erect. The cut is made at a slope just above the union, and should be sealed with some suitable substance, such as Bordeaux paste or lime sulphur.

Plate 185.

Bark Graft: Scion Inserted.

Plate 186.

Bark Graft: Scions Inserted.

Reworking.

In Queensland avocado plantings there are some unprofitable types of seedlings which can be reworked to good commercial varieties.

Reworking by means of bark grafting and by side grafting has been successful. Either method, as in budding, should only be used—except in the case of large trees, or trees with no branches close to the ground—during the growing season when the sap is flowing freely.

Bark Grafting.

When using the bark graft, three or four limbs evenly spaced round the trunk of the tree are selected and sawn off square about 2 or 3 feet from the trunk. The cut surfaces should be smoothed over with a sharp knife and two scions inserted opposite each other in each limb. If both

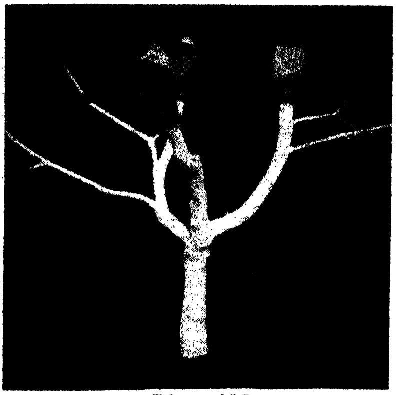


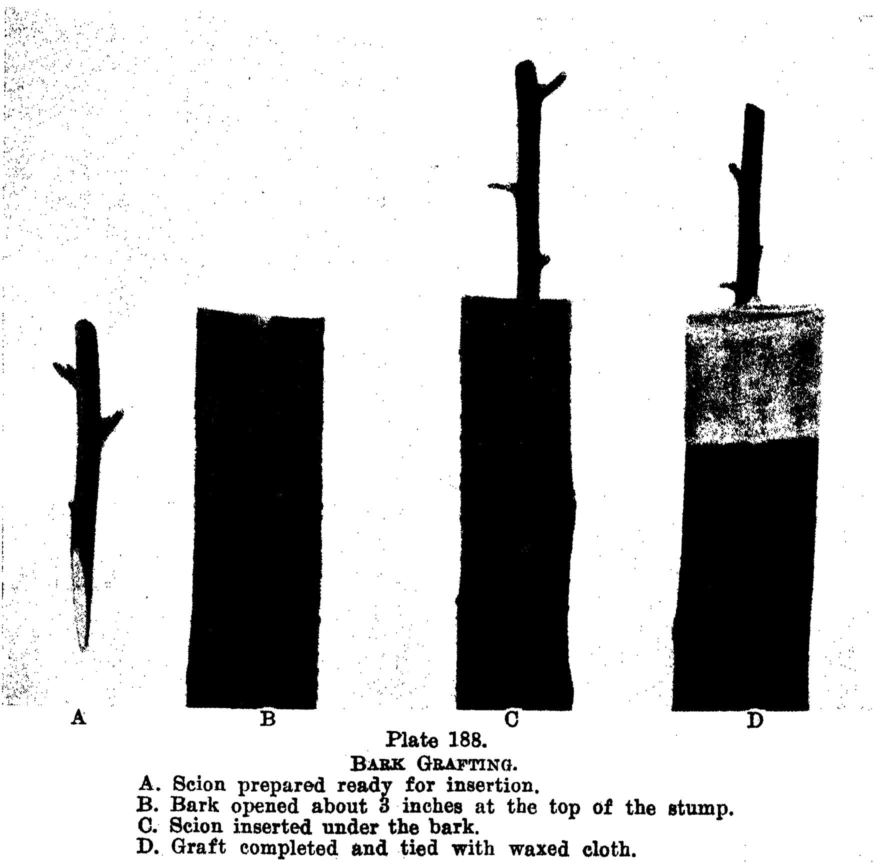
Plate 187.

TOP WORKED BY BARK GRAFTING.—Whitewashed to prevent sun scald; paper-bag protection of scions.

scions grow, the weaker one may later be removed. The scions are easily inserted by making a cut about 3 inches long for each scion through the bark at the end of the stumps and then pushing the scions down between the bark and the wood.

The scions should be selected from well-matured second-growth wood, the terminal growth being discarded, and each should contain two or three plump buds, which at the same time should not be too far advanced. Where possible, it is an advantage to include a node, as adventitious buds often develop from this zone. The scions are prepared by making a long sloping cut about 2 inches to $2\frac{1}{2}$ inches long on one side (Plate 188). The cut surface is inserted next to the wood, or more correctly, the cambium layer. When the scions have made good growth, the remaining branches of the tree which have not been cut back for grafting may be completely cut away.

Very large trees, or trees with no branches within 3 or 4 feet of the ground, require slightly different treatment. During winter, when

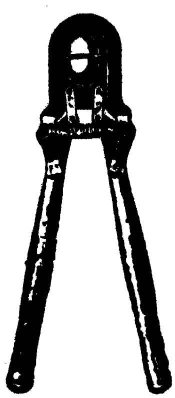


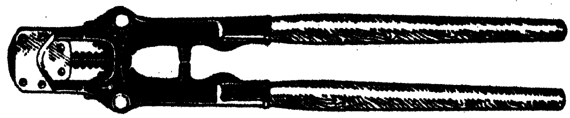
A B C D

Plate 188.

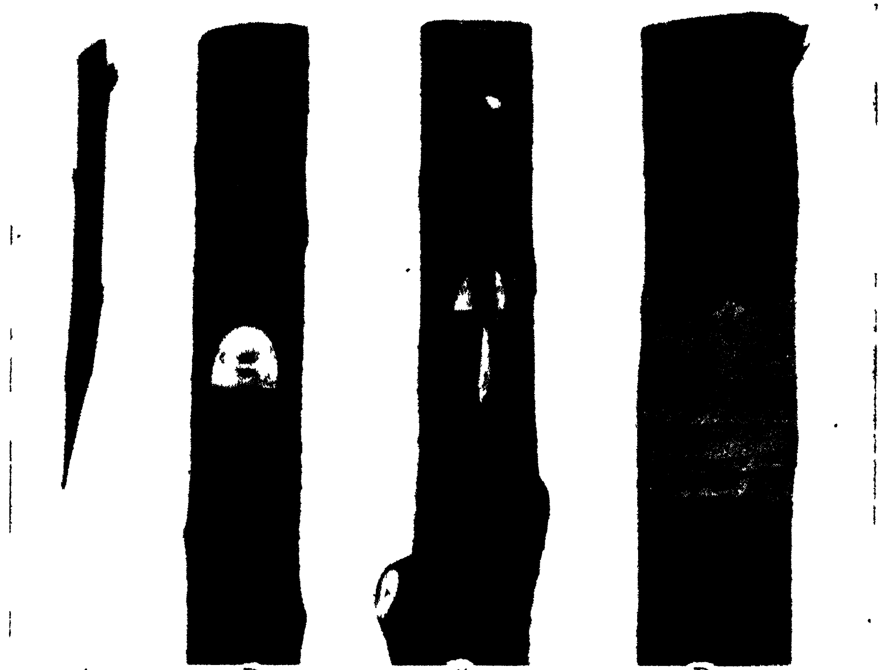
BARK GRAFTING.

A. Scion prepared ready for insertion.
B. Bark opened about 3 inches at the top of the stump.
C. Scion inserted under the bark.
D. Graft completed and tied with waxed cloth.






QUEENSLAND



A B C D

Plate 189.

SIDE GRAFTING.

A. Scion cut ready for insertion.
B. Stock prepared.
C. Scion inserted in stock.
D. Graft completed and tied with waxed cloth.

the trees are dormant, the whole of the top of the tree may be removed by sawing through the trunk at a height of 3 feet from the ground, and at the beginning of spring inserting three or four scions under the bark. Two of these, or at most three in the case of very large trees, may be allowed to grow.

Side Grafting.

Side grafting differs from bark grafting in that it is not necessary at the outset to remove any of the top of the tree. Three or four limbs up to about 3 inches in diameter and evenly spaced round the tree should be selected. Semi-circular pieces of bark should be removed and "T"-shaped incisions should be made through the bark of each of these (see Plate 189), similar to the "T" cut made for budding, and the scions pushed down between the bark and the wood. The scion is prepared similarly to that for the bark graft.

The scions may be firmly fastened to the limbs by driving a fine tingle through them, but care must be taken that they are not bruised or split. In any case, the scions should be securely tied with twine and waxed cloth and all cut surfaces properly sealed.

If the scions are still green after three weeks, the head of the tree may be gradually removed during the following months in order to force the sap into the scions. When these have made a good growth, the whole of the original head of the tree may be removed.

Any limbs which have been exposed in the course of reworking should be whitewashed to prevent sunscald.

Plate 190.
NEW HEAD GROWING

Plate 191.
WHERE TWO SCIONS GROW, THE WEAKER IS REMOVED

Plate 192.
SIDE GRAFT

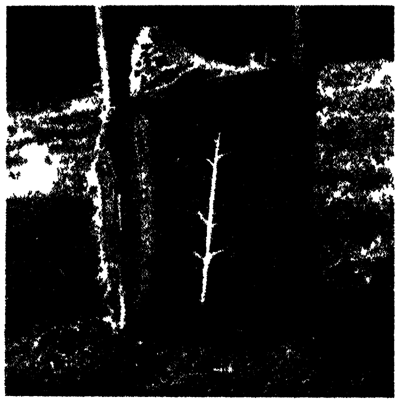


Plate 193.
NEWLY PLANTED TREE PROTECTED FROM SUN AND WIND

In grafting, the following work is of great importance. The trees require to be gone over frequently and the sucker growth removed, in order to confine the flow of sap to the scions, which will also require supports to prevent them being blown out by the wind. All the large cut surfaces will also require to be painted with Bordeaux paste or lime sulphur solution to prevent the entrance of organisms causing decay.

Planting.

On level lands and those with a gentle slope, orchards are generally laid out on the square system. On the steeper hillsides, contour or modified systems of contour plantings should be adopted.

When planted on the square system, the planting distances may vary from 25 feet by 25 feet to 30 feet by 30 feet. Avocados are vigorous-growing trees and require plenty of room.

The union of the stock and scion is always a weak spot in a tree and liable to attack from fungous diseases. It should, therefore, where trees have been worked low down, be kept above the level of the soil.

If the land has been properly prepared, there is no need to dig big holes for the trees. So long as the holes are wide enough to spread the roots, they need not be more than 12 inches deep. The roots should be evenly spaced at a downward angle of about 45 degrees, and the hole then almost filled with fine top soil and tramped firmly. Before the hole is completely filled, the application of 3 to 4 gallons of water to each tree will drive out any dry air from round the roots and assist the tree to get a good start.

The season of planting may be governed by local conditions. Spring plantings often entail frequent waterings, as the young trees should never want for moisture. Planting in February during the wet period, therefore, is often preferable.

Cultivation.

General cultivation during the drier spring months to suppress weed growth and prevent its competition with the trees for soil moisture is important. Summer and autumn rains are utilised for the growing and turning under of green manure crops. These, however, should never be permitted to carry over to the spring, but should be ploughed in not later than the middle of July. Not only do such crops improve the physical condition of the soil, but their presence reduces soil losses by erosion.

With young trees, deep cultivation is advisable in order that large quantities of organic matter, such as manure and green manure crops, can be deeply incorporated with the soil. There should be no danger of injury to the roots of young trees in cultivation to a depth of 8 to 10 inches. However, as the trees become older, their rooting systems extend widely in all directions, and, therefore, as such deep cultivation will be liable to cut too many feeding roots, shallower cultivation is advisable, particularly close to the trees.

Avocados up to two or three years old occupy a relatively small proportion of the total area on which they are planted, thus during the early years of an avocado plantation an excellent opportunity is afforded for building up a reserve of vegetable matter in the soil. At this stage, cultivation, even early in the season, may be confined to the immediate vicinity of the trees, and the space down the middle of the tree rows occupied by growing and turning under summer, autumn, and winter green manure crops.

Pruning.

The avocado tree requires little or no pruning, once its framework has been established. In general, the aim should be to establish a strong symmetrical tree having well-spaced branches which will readily support heavy crops of fruit.

At planting, the young tree should be headed back in order to counterbalance the loss of roots as a result of digging from the nursery and to assist in establishing a strong framework. Such pruning should be done just above the strongest of the dormant buds which terminate the growth cycles of the trunk of the young tree. On starting, these buds usually make upright growth. The practice of heading back to laterals with the hope of developing one of these into a head has not been successful. Subsequent pruning consists in pinching out terminal buds and the removal of crossing and crowding branches. The kind

and amount of pruning differs with varieties. Trees of a straggling and spreading habit should be pruned to direct the growths upwards. On the other hand, tall-growing varieties require to be topped and cut to buds pointing outwards to preserve low heads. As the trees grow older, the lower limbs require to be shortened back and finally removed to make room for the upper larger ones which bear down.

Harvesting.

Considerable difficulty has been experienced in the harvesting of some varieties. The avocado does not soften on the tree, and with many varieties external indications of maturity are hardly perceptible. The correct stage at which to harvest is thus difficult to determine.

In the case of most of the dark-coloured varieties, the fruits develop their colour when maturity is reached. With such varieties harvesting is relatively easy, but in the case of varieties which retain their green colour, it is much more difficult to decide when to harvest. A close observation of the fruit usually shows a slight change in colour in the skin and stem as it approaches maturity. The brightness of the fruit is not quite so pronounced and a yellowish tinge is perceptible on both skin and stem, indicating that maturity is approaching.

The fruit of some varieties will hang for weeks after the normal season for harvesting has passed. On the other hand, the seed may sprout in the cavity of some fruits which have been permitted to hang too long.

All fruits should be clipped from the tree, and double cutting done so as to ensure that the stem is cut flush with the fruit. Pulling the fruit should be avoided, as damage to the button usually occurs, facilitating entry of decay organisms.

Investigations in Progress.

Large scale field trials have been established at Woombye, Flaxton, and Manly. These projects are being developed in co-operation with officers of the Research Division of the Department of Agriculture and Stock. The trials embrace soils typical of those considered suitable for commercial avocado culture in the southern Queensland coastal region.

The work at present in hand includes (1) rootstock trials, (2) scion compatabilities, and (3) the commercial values of varieties considered superior.

A compilation of the data from this work will be undertaken and information of interest and value published through the *Queensland Agricultural Journal* from time to time.

Acknowledgment.

Criticisms and suggestions made in the course of preliminary investigations in connection with avocado culture in Queensland and also in the preparation of this publication by Mr. W. A. T. Summerville, Senior Research Officer (Horticultural Section), Department of Agriculture and Stock, have been very helpful and have been appreciated accordingly.

REFERENCES.

ROBERT W. HODGSON.—*The Californian Avocado Industry.* California Agric. Extension Service Circular 43.

T. RALPH ROBINSON and E. M. SAVAGE.—*Pollination of the Avocado.* U.S. Dept. of Agriculture. Circular 387.

W. T. POPE.—*The Guatemalan Avocado in Hawaii.* Bulletin 57.

Cross Breeding Experiments in the Bowen District.

S. F. KAJEWSKI, Fruit Branch, Bowen.

CLIMATIC conditions in the Bowen district make it eminently suitable for the production of winter- and spring-grown fruit and vegetable crops. Because of difference in climate, varieties which are grown successfully in southern Queensland are naturally not always so suitable for the north. They often do not produce as prolifically and are more subject to disease. Growers have made their own selections for a number of years and have succeeded in no small way in overcoming preliminary difficulties. There is, however, still room for improvement. The following report on cross-breeding experiments, with tomatoes and with passion fruit in particular, is, therefore, of especial interest:—

Tomatoes.

Tomatoes are grown extensively in the Bowen district. Local selections have been made for many years, and this has resulted in the production of many types of plants, vigorous, heavy bearing, and more or less resistant to disease. There are difficulties, however, in that the fruit is not standardized; it often ripens a dull pink colour on the market and is not always of the best quality.

About three years ago, with the approval of the Department of Agriculture and Stock, it was decided to undertake some cross-breeding work in an effort to raise improved varieties suitable for the district. As a commencement, a thorough examination was made of local types, and one was selected finally as a parent. This was a Buckeye-Globe combination, which showed evidence of wilt resistance, heavy cropping, long life, and large fruit. Points against it were that it was subject to mosaic disease, and the fruit when ripe was a dull pink colour. This was crossed with the canning tomato, San Marzana. This variety was subject to fusarium wilt, but was immune to mosaic disease. The fruit, when ripe, had a bright red colour and a tough skin, but was small and elongated.

Difficulty was experienced in making the cross, because the local variety was derived from two imperfectly fused flowers, while the San Mazana has a single type flower with delicate pistil. After several attempts a number of fruits was obtained and the seeds of these were sown. As is usual with hybrids, the resultant seedlings grew very vigorously and completely outstripped plants of other varieties of the same age.

The foliage structures and habits of the seedlings were midway between those of the parents, and there was no noticeable variation in the growth of any of the plants. The fruit on each of the plants also was similar and was shaped like capsicums with large air spaces and a fiery red skin when ripe. Seed from the best plants and fruits was selected and sown and the second generation of seedlings raised. These, when fruited, produced a very wide range of types, and both fruit and leaf structures varied to a marked degree. Many reverted largely to the original parent types, but a few showed indications of promise.

Seed from these was selected and a third generation of seedlings raised. These, when fruited, showed a further wide range of types, but the degree of resistance and susceptibility to disease was now being manifested and better types of fruit appearing.

Seed from the best was again selected and a fourth generation of seedlings raised, which yielded much more promising results. The growth of the plants was more uniform; they were smaller than most of those grown at Bowen and more compact. There was a greater degree of disease resistance. The fruit was solid and of rich scarlet colour when ripe, and of good marketable size.

The smaller bush was one of the objects aimed at for the reasons that it will ensure easier, cheaper, and more effective dusting. Secondly, the harvesting period is reduced to six weeks, which will enable growers to pick their green fruit nearer to maturity. Thirdly, the shorter cropping period will mean less handling of the bushes, which is one of the means by which mosaic and other diseases are spread. The length of the season will, of course, be maintained by plantings made at intervals.

At the present time, Bowen tomatoes are planted at distances varying from 8 feet by 8 feet to 12 feet by 12 feet apart, and the growth is so vigorous that the vines completely cover the ground. Complete dusting is, consequently, almost impossible, and the crops, though very large, are often reduced by half through wastage. The harvesting period from these huge bushes is extended and makes the picking of green fruit for maturity difficult; also the frequent handling of the bushes over an extended period provides a greater risk of spreading diseases.

For the purpose of determining the degree of resistance of the type which has been selected as the best from these experiments, a severe test was made by planting and growing a crop under adverse hot conditions when the degree of resistance is low. For comparison, plantings of three other selected hybrids were made at the same time. In the case of the three latter types, mosaic affected two of the types 100 per cent. and 28 per cent., respectively, and did not affect the third; while estimated fusarium wilt infection was 30 per cent., 20 per cent., and 30 per cent., respectively. In respect of the selected variety, mosaic affected 8 per cent., and fusarium wilt infection was estimated at 10 per cent. During the cooler months when the main crop is grown, the infection would, of course, not be nearly as high.

Preparations are now being made for planting a considerable area for the fifth generation from which seeds of the best plants will be distributed to growers.

Passion Fruit.

The purple-fruited passion fruit, *Passiflora edulis,* is the most popular on the market in Queensland, and is, consequently, the most largely grown. It finds, however, difficulty in adapting itself to the climatic conditions of North Queensland, where it is very subject to disease and its life is short.

There is, however, in the North a golden-fruited American variety (*Passiflora incarnata*) which grows with exceptional vigour and is apparently not subject to the diseases common to *P. edulis.*

The yellow colour, hard shell, and lesser flavour of *P. incarnata,* however, makes it less attractive commercially than *P. edulis.*

In regard to maturity, *P. edulis* ripens its fruit in the Bowen district during November and December, and *P. intcarnata* during April and May.

In 1939, an effort was made to combine the desirable characteristics of each variety and, at the same time, extend the harvesting season by the production of hybrids. Pollen was transferred from the flowers of ***P. edulis*** **to those of** ***P. incarnata,*** but, because pollination of the latter variety is not readily accomplished, the crossing resulted in many failures. However, eventually, two fruits set, and from these 100 hybrids were raised. These were uniform in type, the foliage in each instance being midway between *P. incarnata* and *P. edulis.* In this respect, they resembled the result of the first crossing with the tomatoes, with the exception that the leaves of the hybrid passion vines were twice the size of those of the parents. The hybrids were found to be mules and as difficult of pollination as *P. incarnata.* They flowered profusely, but would not set fruit. A careful examination of thousands of flowers borne by the 100 plants showed that certain flowers would almost set, having an unfertilized embryo fruit much larger than ordinary. Technically, this condition is known as a diploid structure. Pollen from *P. edulis* was used in a straightforward effort to pollinate these flowers, but with no success. Pollen of different ages from *P. edulis* was then experimented with, as also were different stages of maturity of the receptive flower, and eventually two fruits set. These fruits when grown could easily be distinguished as diploids, as they were the size of teacups when ripe. The seed was saved and planted and the plants set out in what is later referred to as Block 1.

By continuously trying similar methods of pollen transference from one hybrid plant to another, using ordinary flowers and not diploids, several fruit set eventually from ordinary flowers. In all about 1,000 flowers were treated to obtain these fruits, which were about one-quarter the size of the diploids. The plants grown from the seeds of these fruits were subsequently planted out in what is hereafter referred to as Block 4.

In addition, pollen from the flowers of the hybrids was crossed back on to *P. edulis.* This work was easy, being 100 per cent. effective. Seeds selected from the fruits of this cross were subsequently planted out in what are referred to as Blocks 2 and 3.

The result of all the foregoing work was that a total of 489 plants were set out in the field on trellises as follows:—

Block 1 = 2 parts *Edulis* plus 1 part *Incarnata* on hybrid plants (diploid structure).

Block 2 = 2 parts *Edulis* plus 1 part *Incarnata* on *Edulis* plant (ordinary structure).

Block 3 = Duplicate of 2.

Block 4 = 1 part *Edulis* plus 1 part *Incarnata.*

To complete possibilities of the cross, 2 parts *Incarnata* plus 1 part *Edulis* is necessary, but because of the poor setting qualities of *Incarnata* this has not been attempted.

A number of *P. edulis* vines were grown adjacent to the experimental blocks for comparative purposes, and in the following analysis of results from the blocks to date, the plants described as "specials" are better than the control *Edulis*; those described as "good" are equal

to the control *Edulis,* while those described as "inferior," even though setting fruit, are not as good as *Edulis.* All of the vines in the blocks flowered, so that the analysis is based on spring fruiting only. Another calculation will be made for autumn fruiting:—

Block 1 produced—

2 specials
8 good
14 inferior
33 infertile
—
57

Forty-two per cent of the vines thus fruited, showing the influence of the better setting qualities of *P. edulis.* This block, which was planted from seeds from the diploid fruits, also has a higher percentage of plants setting fruit than the cross represented in blocks 2 and 3.

Block 2 produced—

4 specials
10 good
34 inferior
108 infertile
—
156

In this block, 31 per cent. of the plants fruited.

Block 3, which was a duplicate of Block 2, produced—

4 specials
5 good
18 inferior
69 infertile
—
96

In this block, 27 per cent. of the plants fruited.

Block 4 produced—

4 specials
4 inferior
172 infertile
—
180

The fruiting in this block was only 4·4 per cent., indicating the non-setting influence of *P. incarnata.* The plants all flowered, and it is possible that some at least may set heavy crops in the autumn.

What appeared to be a virus disease resembling mosaic in tomatoes showed up severely in 25 plants in Block 4 and 16 of them were so severely affected as to be useless. Neither parent or any plant in Block 1, 2, and 3 showed any signs of the trouble. Why it should appear in Block 4 is a question still to be answered. Back crossing may put additional vigour into the strains and prevent infection.

Further progress reports on both tomato and passion fruit crossing experiments will be made from time to time.

Poultry Farming in Queensland.

(Continued from page 403, November, 1941.)

FEEDING OF POULTRY.

ROOTS AND TUBERS AS POULTRY FOOD.

Because of their bulk, most roots and tubers have a limited value as poultry foods, but when market values are low they may be fed economically. Principally on account of their heavy yielding capacity, however, mangels, sweet potatoes, and pumpkins may be grown, especially as supplementary foods. The value of these crops must not be over-estimated, and care must be taken not to incorporate too great a quantity of any of these roots or tubers without giving due consideration to the ration in conjunction with which they are fed. As previously mentioned, the total daily food intake of poultry is limited to approximately four ounces dry weight daily, and they cannot cope with an exceedingly bulky ration.

Root crops and tubers range in moisture content from about 70 per cent. in sweet potatoes to 90 per cent. in mangels, the total dry matter, therefore, being from as low as 10 per cent. to slightly under 30 per cent. The nutritive ratio of these crops is very wide when compared with the usual concentrated foods usually fed to poultry. At the same time, as most of the bulk of these crops is water and not fibre, it has been found practicable to include them in the ration to the extent of 50 per cent. of the total weight of food.

In an experiment conducted at the National Institute of Poultry Husbandry, England, potatoes were used to supplement the poultry rations. Four pens of birds were used and these were fed as follows:—

—	Mash.					Grain. Oz. per bird daily.	Potatoes. Oz. per bird daily.
	Maize Meal.	Pollard.	Bran.	Meat Meal.	Clover Meal.		
	Parts.	Parts.	Parts.	Parts.	Parts.		
Pen 1 ..	37½	27½	20	10	5	1	0
Pen 2 ..	25	27½	20	10	5	1	2
Pen 3 ..	12½	27½	20	10	5	1	3
Pen 4 ..	..	27½	20	10	5	1	4

NOTE.—During the first two months fish meal was fed, but this was substituted by meat meal 9 parts, plus 1 part of salt. Oyster shell was provided *ad lib* to all pens.

Although the average daily intake of food per bird is approximately 4 ounces, some birds in this experiment consumed as much as 4 ounces of dry food in addition to 4 ounces of potatoes.

Therefore, when attempting to induce birds to consume the maximum quantity of root and tuber crops, it is advisable to feed them on a good laying mash, working in about 30 to 40 per cent. of steamed roots or tubers, and feeding grain at night. With this method the amount of grain fed could be reduced considerably.

Potatoes.

Of the roots and tubers dealt with in this chapter, potatoes are the highest in feeding value, but because of their market value, it is only at odd times that they may be fed profitably to poultry. They contain 2·2

per cent. of protein and 17·4 per cent. of carbohydrates. By feeding them in a cooked state, mixed with the mash, there is practically no waste, and the birds are encouraged to eat fairly large quantities.

Sweet Potatoes.

Sweet potatoes contain only 1·6 per cent. of protein, but are as high as 26·4 per cent. in carbohydrates; therefore, although their nutritive value is lower, they may be used to approximately the same extent as potatoes. Because of their size, and the fact that they are palatable to poultry, sweet potatoes may also be fed in the raw state. Before being fed raw they should be chopped or split.

Mangels.

Mangels are useful as poultry food, and may be used largely as roughage and fed as a mid-day meal to poultry. Although not taking the part of green feed, mangels are useful as an adjunct to any ration, being ready for harvesting in the spring when dry conditions usually prevail in South-eastern Queensland. Mangels contain only ·8 per cent. of protein and 6·1 per cent. of carbohydrates, and are nearly 90 per cent. water, but as the average yield per acre is high, they are suggested as a good supplementary feed. They are palatable and poultry have a natural liking for them. If split and hung up just within reach of the birds, poultry are provided with a profitable pastime in pecking at them. Overfeeding of mangels may induce scouring.

Pumpkins.

Pumpkins are fed in much the same manner as potatoes, but as the seeds are reputed to be poisonous, these must be removed before cooking or before being fed in a raw state. Pumpkins contain 1·7 per cent. protein, 5.2 per cent. carbohydrate, and about 90 per cent. moisture. Therefore, as it is low in feed value, the quantity of pumpkin in a ration should be less than that of potatoes or sweet potatoes when it is being utilized in their stead.

Swede Turnips.

Swede turnips may be fed in much the same manner as mangels, but are usually pulped or cooked and mixed with a wet mash, or split open and fed as a supplement to green feed and mash They have about the same feed value as mangels and pumpkins, containing 1·3 per cent. protein and 7·2 per cent. carbohydrates.

Carrots.

Carrots contain vitamin A, and when available would make a valuable addition to the ration. They have about the same nutritive value as mangels, but should be fed in a minced state, mixed with mash.

Coconut Meal.

The need for a substitute for wheat bran is always in evidence, and as this shortage is likely to exist permanently the poultry farmer may, at times, be forced to incorporate a substitute for bran in his rations.

Apart from its nutritive value, bran is used to give bulk to a ration and improve its physical condition, thus encouraging a healthy intestinal action.

Coconut meal has a similar effect, and when available may be used extensively. Its protein content (19·0 per cent.) is higher than that of bran, whilst the oil content (5·0 per cent.) is almost double.

English experiments, in which coconut meal replaced bran on a weight basis, demonstrated that a ration containing coconut was slightly superior for egg production to one containing the same quantity of bran. In these experiments coconut meal was used to the extent of 25 per cent. of the ration.

However, as birds cannot tolerate large amounts of oils and fats, it is not recommended that the whole of the bran portion of the ration be replaced by coconut meal unless most of the other ingredients of the ration are particularly low in fat or oil content.

FEEDING OF DUCKS.

Ducklings should not be fed until forty-eight hours after hatching. Water and coarse sand may be supplied when the ducklings are placed in their brooding quarters. Coarse sand should always be supplied to ducks as its consumption aids digestion. Ducklings should be fed mashes similar to those used for feeding chickens. The mash should be moistened to a crumbly consistency and several feeds given daily. This system of feeding should be adopted until they are four weeks of age, and the numbers of feeds then reduced to three, and then later to two.

From four weeks, mashes similar to those used for laying hens may be employed, but each mash should have its bulk increased by the inclusion of 25 per cent. of good succulent green feed. Bran and pollard have formed the major part in duck rations, and when available a mixture of pollard 2 parts, bran 1 part, green feed 1 part, with the addition of meatmeal and salt may be used. Meatmeal should be added to the mash at the rate of 1 lb. for every 10 lb. of bran and pollard, and salt at the rate of 2 oz.

When skim milk is available curds may be used to replace the meatmeal. The curd from 1½ gallons of milk would be almost equivalent to 1 lb. of meatmeal. Although milk is a most valued food, it is not desirable to supply it to ducks as a liquid because of their method of drinking.

Root crops and pumpkins, when available at reasonable prices, form a useful addition to the ration of ducks. They should be fed as recommended in the section dealing with such fodders.

The feeding of grain to ducks is not practised extensively. A little at mid-day may be fed. Some breeders prefer to soak grains for ducks.

Clean water should be kept continuously before the birds, and the water should be sufficiently deep to permit of the birds totally immersing their heads. This enables the bills and eyes to be kept clean The constant supply of water is equally essential for both young ducklings and adults, but with the former the vessel should not permit of ducklings gaining access for the purpose of swimming.

FEEDING OF TURKEYS.

Feeding should be commenced twenty-six to forty-eight hours after hatching. Water and grit (coarse sand) may be given when they are placed in the brooder. The water should be given by means of a fountain to protect the young birds from drowning. The feeding practice may be either dry mash and grain, wet mash and grain, or an all-mash. If the all-mash method is employed, it should be changed when the young turkeys are about ten weeks of age to mash and grain.

In the feeding of wet mash, frequent feedings should be employed during the early life. Start with five feeds per day, gradually reducing

to one feed of mash and one of grain when the turkey chicks are ten weeks old. The mash should be placed in small receptacles that offer the maximum protection from fouling and, if dry, that avoid wastage.

Turkeys, like chickens, require different rations for different ages. The starting ration should contain approximately 20 per cent. of crude protein. This may be continued until ten weeks of age, when the protein level may be reduced to 15 per cent.

The kinds of food that they should receive are largely dependent upon what foodstuffs are available in the locality in which the turkeys are reared. There is one point that turkey raisers should remember, and that is that no single food supplies all the requirements of the young birds, and that it is more economical to purchase some additional foods to supplement home-grown grains than to limit the ration to the foodstuffs grown on the farm.

The following ration used at the Oklahoma Agricultural Experiment Station, U.S.A., has been reported as giving results, and is one that could be used in many districts in Queensland:—

25 lb. bran	3 lb. cottonseed meal
25 lb. pollard	5 lb. dried buttermilk
25 lb. yellow corn	¾ lb. salt
7 lb. lucerne meal	¾ lb. powdered limestone
5 lb. meat meal (63%)	1½ lb. bonemeal

The average weights of turkeys raised in this experiment are most interesting and are as follows:—

Age.	Males.	Females.	Average Weight.
	Lb. oz.	Lb. oz.	Lb. oz.
4 weeks	. .	. .	0 12
8 weeks	2 6	1 14	2 2
12 weeks	5 1	4 0	4 8
16 weeks	8 9	6 0	7 4
20 weeks	12 0	7 14	9 14
24 weeks	15 8	9 9	12 8

In an experiment conducted in Great Britain at the Newton Rigg Farm the following rations were used:—

——	Starting. 1 to 10 weeks.	Growing. 10 to 24 weeks.	Fattening. 24 to 27 weeks.
	Lb.	Lb.	Lb.
Pollard	25	25	. .
Bran	22	26	20
Maize Meal	20	25	. .
Sussex Ground Oats	10	10	10
Fish Meal	6	3	10
Soya Bean Meal	8	5	. .
Cod Liver Oil	2	1	. .
Salt	½	½	. .
Ground Limestone	. .	2	. .
Dried Skim Milk	7	. .	. .
Crude Protein content of the above ration was :—			
	18%	15%	14%

Grain Mixture :—2 parts of wheat and 1 part of cracked maize.

Practice of Feeding.—A very crumbly mash was fed five times daily during the first week and half grain and half mash for the last feed in the day. This was reduced to four of mash and one of half grain and half mash for the second week, three of mash and one of half grain and half mash for the third and fourth weeks, after which they received two mash and one half grain and half mash to within three weeks of killing. For the first four weeks chopped clover leaves were mixed with the mash. At eight weeks narrow-stemmed kale was fed at the rate of 12 lb. daily. Growers' mash was fed from ten weeks to within three weeks of killing, when fattening mash was given three times daily in a crumbly state.

In the feeding of turkeys, consideration must be given to the class of food they are likely to gather while on range. Insect life and grass seeds plus succulent grass are all possibilities. Insect life is of a high protein nature, and when plentiful it may be very desirable to reduce the animal protein that is used with any mash mixture. In general practice, however, farm poultry and turkeys generally suffer from a lack of protein.

Feeding the Breeding Stock.

Turkey hens may lay as early as seven months when given a good start in life and fed a ration that is conducive to production, but production can usually be expected at about eleven months. For breeding purposes the turkey hen should not be too fat. A mash of bran 1 part, pollard 2 parts, plus 10 per cent. of meat and bone meal, with grain at night, will promote production and keep the birds in the best breeding condition. In addition to the above a plentiful supply of succulent green feed should be given, and a shell grit should be available at all times. Where it is impossible to obtain greed feed, lucerne chaff of good quality could be added to the mash to the extent of 10 per cent. When this is to be used it is better to soak it overnight. There may be localities where crushed grains would prove more economical than bran and pollard. When such is the case they may be used to advantage, but it is advisable to have some bran to give a mash a crumbly consistency, and where possible to use a mixture of crushed grains in order to add variety. When skim milk is available, it may be used to mix the mash or may be given to the birds to drink. The meat and bone meal may then be reduced by 1 lb. for every 1½ gallons of skim milk supplied.

American investigators of the United States Range Live Stock Experiment Station found that the following average quantities of food were consumed per bird per week over a period of forty-eight weeks:—Males, 5·88 lb.; females, 3·15 lb. A breeding pen of one male and fifteen females would, therefore, consume, during a period of twelve months, 2,762 lb. of food.

FEEDING OF GEESE.

On most farms sufficient food in the form of grazing will be available for the adult flock of geese. Geese are good foragers, but when vegetation is scarce green feed and grain should be provided. About 2 or 3 oz of grain should always be given per bird as an evening meal

With goslings which are being prepared for market a ration such as is recommended for the feeding of other table poultry is recommended.

Goslings require no food for upwards of thirty-six hours after hatching, although up to this period they may be supplied with water and grit or coarse sand. At thirty-six hours they may be given their

first feed which may consist of equal parts of bran and pollard and the same quantity of some grain, such as sorghum, wheat, maize, or barley, moistened preferably with milk to a crumbly mash. Finely-chopped green feed may also be mixed with the mash and will prove beneficial to the goslings. Clean sand which should always be available to the goslings may be sprinkled over the mash. Three feeds per day of the above mixture should be given for about one month. After this period, provided there is plenty of good grazing available in the form of succulent greenstuff, the number of feeds may be reduced to one.

To obtain a good marketable carcase goslings need to be fed liberally up to four months of age.

Geese, both young and adult, should always be kept supplied with good, clean drinking water, but the drinking vessels for the goslings should be so constructed that they can only get their heads into them.

The sitting goose should always be given a supply of grain as she is usually unable to collect sufficient food during the short time she is off the eggs.

MEDICINAL DRUGS FROM WEEDS AND TREES.

In England, Boy Scouts, Girl Guides, and women volunteers are gathering an unusual wartime harvest. They are picking stinging nettles, dandelion roots, meadow saffron, and other herbs containing useful medicinal drugs.

Before the war most of these drugs were imported. To-day, skilled gatherers are earning quite a lot by clearing the countryside of what to the farmer and the gardener are just weeds. For example, dried nettles fetch £30 to £50 per ton, and dandelion roots as much as £5 per cwt.

And according to a report from an American university, inexpensive substitutes for novacaine, antiseptics, and possibly sulfanilamide and its derivatives may soon be made from corn cobs, oat hulls, and other farm waste materials.

Similar work is being done in Australia at the present time. Conditions arising out of the present world situation have prompted science workers at Canberra to start experiments in the cultivation of plants yielding certain important drugs. At the same time, they have sponsored a survey of the natural flora of Australia, with a view to bringing into use any medicinal plants already known and other plants, the medicinal properties of which have yet to be discovered.

One particular Australian plant which has become important as the source of a valuable drug is Duboisia, a tree known to most of us as corkwood. Corkwood leaves contain in commercial quantity a powerful sedative drug known as hyoscine. There is a world shortage at present of hyoscine, because of its greatly-increased usage in the treatment of mental disorders arising out of the war. As a matter of fact, drug manufacturers are now paying as much as 3s. 6d. a lb. for corkwood leaves.

Dr. Joseph Bancroft, who is well remembered in the Burnett district—at Eidsvold and other places—is credited with the discovery of the value of corkwood as a source of hyoscine. How he found out about it is rather interesting. One day his daughter got some of the green plant material of the corkwood in her eye. Like other plants of the same natural order, one of its properties causes dilation of the pupil of the eye. It was this peculiarity observed by Dr. Bancroft while treating his daughter for the injury to her eye that started him on his investigation of the cause of the trouble, and so discovered that corkwood leaves contain the drug called hyoscine.

Anyone gathering corkwood leaves should be very careful in handling them, for the hyoscine they contain is a powerful poison and its ingestion into the human system in the very smallest quantities may cause serious ill effects. And especially is it necessary to be careful to prevent any of the plant material entering one's eyes, nose, or mouth, or coming in contact with broken skin or tender parts of the body.

The corkwood tree is common to the coastal belt of Queensland, and also northern New South Wales.

Queensland Gum Trees.

SCRIBBLY GUM OR WHITE GUM (Eucalyptus micrantha).

THE scribbly gum or white gum is a large tree with a smooth white or blotched bark. The bark is nearly always marked with scribbly, brown lines, hence the common name. The "sucker" leaves or leaves on stump shoots are large, up to 9 inches long and 4 inches wide. The leaves on the adult tree are much smaller and narrower, being mostly about 5½ inches long and about 1 inch at the widest part. The contrast is well shown in the accompanying plate. The tree flowers in spring or early autumn. The flowers are borne in the axis of the leaf on a rather slender stalk with six to fifteen flowers in a bunch. The flower buds are club-shaped. Stamens are numerous. The seed capsules are very broadly top-shaped, about ¼ inch in diameter, and with a broad, usually reddish, rim.

Distribution.—A native of eastern Australia from southern New South Wales to central Queensland.

Plate 194.

SCRIBBLY GUM OR WHITE GUM (*Eucalyptus micrantha*).—From left to right: Fruiting branch with seed capsules; "sucker" leaf; flowering branch.

Plate 195.

SCRIBBLY GUM OR WHITE GUM.—A fine specimen growing at Sunnybank, near Brisbane

Botanical Name.—Eucalyptus comes from the two Greek words - eu = well and calypto = I cover, in allusion to the cap of the flower bud which acts as a protection to the centre parts of the flowers—that is, the stamens and pistil, and which is thrown off as these reach maturity. Micrantha comes from the two Greek words micros = small and anthos = a flower, and refers to the flower being smaller than those of a closely-allied species.

Common Name.—Most commonly the tree is known as "scribbly gum," in allusion to the scribble-like markings almost always present on the trunk. It is also known as "white gum," "sugar gum," and "cabbage gum," local names also given to other trees, however. The Queensland Forest Service proposes the name of "white gum" for the timber.

Timber.—The timber is comparatively light for a hardwood and has an average dry weight of about 55 lb. per cubic foot. According to the Queensland Forest Service it has no durability in the ground and little in the weather. Palings of fences at Beerwah rotted completely off at ground level, but the upper parts weather comparatively well. As house stumps it had to be replaced in 3 years. The average life of 55 sleepers replaced by the Queensland Railways during 18½ years was 16·83 years, as against 22·33 years for ironbark. It is an excellent fuel timber and can be used for general building purposes out of the weather.

Oil.—According to the Technological Museum, Sydney, the oil is of the peppermint type used in the mining industry in the separation of mineral sulphides from ores by a flotation process. The principal species distilled is eucalyptus dives, common in the coastal ranges of New South Wales and Victoria. It has a much heavier yield of oil than the Queensland *E. micrantha*.

A SELF-CLOSING GATE.

A farm gate that is self-closing is made like an ordinary gate except that the top bar is 4 inches shorter than the bottom one. Also the upper hinge pin is longer than the lower one by the same amount. When the gate is swung open the latch end will be elevated so that it will swing shut of its own weight no matter how much or how little it is opened.

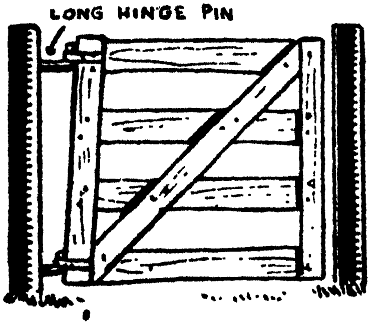


Plate 196.

New Green Manure Crops.*

By N. J. KING.

AMONG the various activities of the Bureau of Sugar Experiment Stations is the testing of green manure crops from abroad or produced in Australia. From time to time this Bulletin has contained articles dealing with the Gambia pea (*Crotolaria goreensis*) and the New Zealand blue lupin, and as a result of our experiments and writings on these two crops both have attained some degree of interest on the part of cane growers.

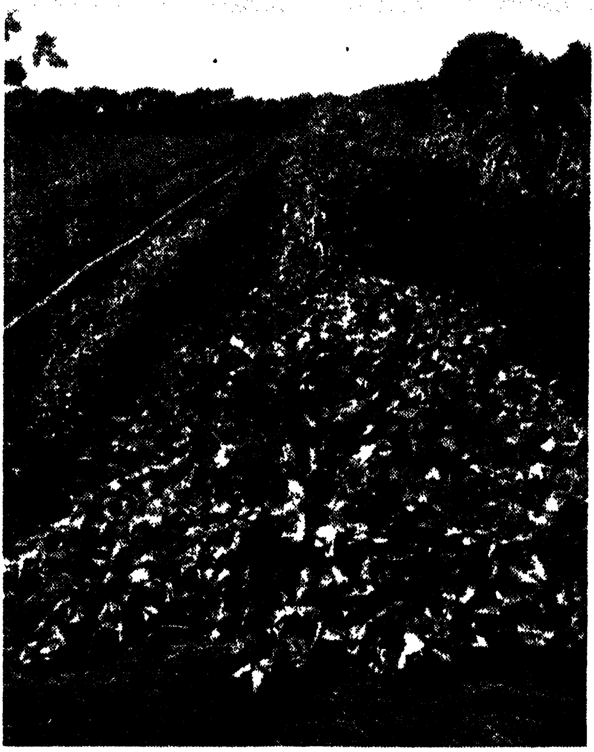


Plate 197.

SHOWING THE GROWTH MADE BY THREE "GIRU" BEAN VINES, BUNDABERG STATION.

Many new species of green manure crops are tried on the Experiment Stations, are found wanting in some desirable feature—such as good early cover, quick germination, vigour, and resistance to bean-fly attack—and are discarded; these the cane grower hears nothing about. The work goes on, however, and when a promising species is found, due publicity is given to the fact and seed is collected to form a nucleus of commercial supplies should the demand warrant it.

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1941.

At the present time two promising species are under preliminary trial at the Bundaberg Sugar Experiment Station. During 1940 the Director (Dr. H. W. Kerr) noticed some plants of a green manure type growing wild in the Giru area. The plants appeared vigorous, though not receiving any attention, and it was thought that any crop of such a nature which would grow without care in an area of such low rainfall may have valuable drought-resisting qualities. Dr. Kerr collected a few mature seeds and these were planted on the Experiment Stations. In Bundaberg only three seeds germinated, and these have grown vigorously; by mid-May they covered an area 20 feet by 12 feet. The conditions were fairly good, and it is possible that Poona pea would have developed just as well. However, the crop appears to have at least one valuable feature not possessed by the Poona pea—and that is a

Plate 198.

ILLUSTRATING THE GROWTH OF *Dolichos biflorus*, WITH SORGHUM NURSE CROP.

prolonged growing period. The seeds were planted in mid-November and only began to flower in early May. The rapid maturing of the Poona pea is in many ways undesirable. It generally forms mature pods in February—in the middle of the wet season—when it is not practicable to plough it in. The result is a thick, volunteer crop necessitating further cultivation to kill it; if planting of cane follows rapidly on the ploughing-in of the Poona pea the volunteer crop may be costly to eradicate from the young cane. Cane growers, particularly in the wet areas, require a crop which would not seed so early in the wet season—in other words, a crop with a long growing period. If this newly discovered species lives up to its present promise it may be a valuable variety in such wet areas. Tentatively the crop has been named the "Giru bean" until such time as it can be identified by the Government Botanist.

The other variety under trial was imported from South Africa. It is named *Dolichos biflorus*. Mr. F. Manson Bailey, one time Government Botanist for Queensland, lists this species as being a native plant in far North Queensland, where it was called "Mal-kan" and "Tandaji" by the aborigines. It is also known as "Horse Gram" in India. This variety is a fine-stemmed creeping plant and it is recommended by South African authorities that it be grown with a nurse crop; this is some tall growing plant, such as sorghum, on which the Dolichos can climb. This species flowered about a week earlier than the Giru bean and is setting a good crop of seed. It is yet too early to state whether this crop has any definite value, but in areas where moisture is plentiful and there is no restriction on maize growing a planting of alternate rows of each may serve a dual purpose—the maize crop could be grown for grain and a green manure crop obtained from the Dolichos at the same time.

The two photographs illustrate the type of crop obtained from the Giru bean and the *Dolichos biflorus*. The latter was planted with a grain sorghum so that it would have a nurse crop on which to climb

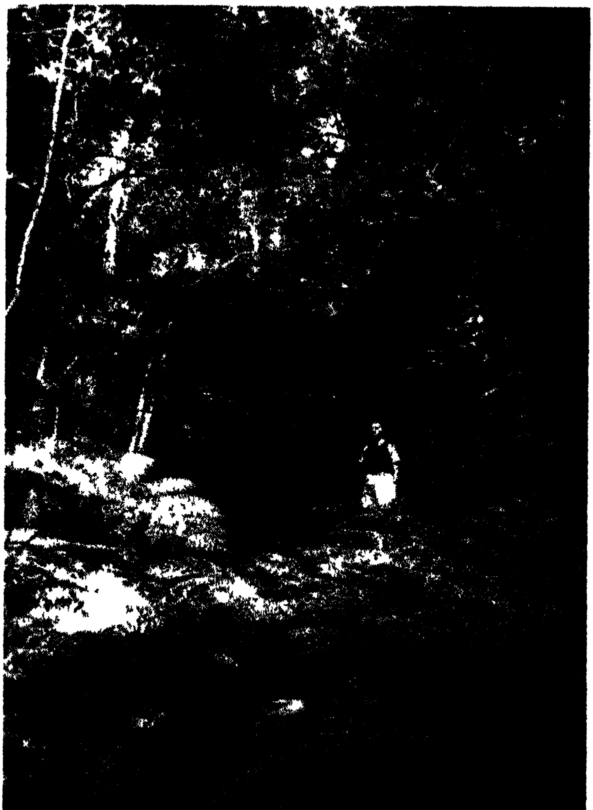


Plate 199.

A RAIN FOREST GLADE, BUNYA MOUNTAINS, QUEENSLAND.

One Year after the 1940 Burdekin Flood.*

By H. W. KERR.

EARLY in April, 1940, the Lower Burdekin district experienced the most disastrous flood in its history. A full account and illustrations of the damage which it caused were presented in the Quarterly Bulletin for July, 1940. Since that time, the writer has visited the district on several occasions, and it may be of interest to record what has been done, both by the farmers and the Government, to repair the damage and guard against a recurrence.

Soil tests made immediately following the flood showed that the subsoil of these river lands, as well as the sands washed from the eroded soils and deposited as the velocity of the flood waters was checked, exhibit a degree of fertility not usually met with under these conditions; and it was forecast that the damaged lands, as well as the fine sand deposits, would be capable of producing crops at no distant date, if the inevitable nitrogen deficiency were made good. That this has been possible is amply demonstrated by the excellent crops of mature cane now to be seen on many such fields. The speed with which the job was tackled and the trouble put right is a high tribute to the courage and determination of the farmers who were so badly hit by the flood.

Plate 200.

ILLUSTRATING THE EXTENT AND NATURE OF THE SANDING WHICH CERTAIN FIELDS EXPERIENCED.—What remained of the mature crop had been harvested when the photograph was taken.

A further interesting set of pictures has been obtained in the course of farm visits and some of these are published at this time. We reproduce, first of all, a view of a badly-sanded field of plant cane (Plate 200), which was printed in the October Bulletin last year. When

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1941.

the same field was inspected later in the year, it was found that the farmer had graded and ratooned the block: the ratoon shoots originated, of course, from the eyes of the buried plant crop sticks, and these had been present in great profusion. However, the farmer destroyed such of these as were not wanted, by the use of implements, to enable him to irrigate the crop if necessary. The block then appeared as shown in Plate 200, and at the present time, this is an excellent crop of mature Badila. Doubtless, the field will be ratooned once more, and continued under such crops as long as possible; this will give the sand a chance to mellow into fertile surface soil before it has again to be planted. The existence of the buried surface soil has certainly contributed much to the nutrition of the present crop.

Plate 201.
ILLUSTRATING THE FIELD SHOWN IN PLATE 202 AFTER THE RATOONS WERE WELL ADVANCED.

The Badila ratoons illustrated in Plate 202 were produced under similar conditions, and are estimated to yield at least 35 tons per acre.

It will be recalled that the Government took early action with a view to repairing the breaks in the river bank, and granted a substantial sum of money to cover the cost of the work. The engineer (Mr. Fison) who was delegated by the Co-ordinator General of Public Works to control the job decided that the repair work might be carried out according to two alternative plans—(1) the construction of earth levees, provided a supply of suitable filling were handy to the job, or (2) the erection of permeable bulkheads (Plate 203). The former type of construction would be the cheaper, but it presented a measure of risk should further damaging floods supervene before the earth works were thoroughly consolidated and protected. The majority of the jobs were therefore of the bulkhead type, but a few earth levees were successfully installed. Fortunately, the 1941 wet season was free from heavy floods, while it was generally favourable for the establishment of protective vegetation on the bared banks.

Plate 202.
An Excellent Crop of Badila Ratoons Produced on a Heavily Sanded Field.

Plate 203.
Illustrating the Details of the Protecting Bulkhead: Note Concrete Apron in Course of Construction.

The illustrations presented provide some conception of the construction of the bulkheads: the purpose of these is to obstruct and restrict the flow of flood waters at the low points adjacent to the river banks, thus effecting a greatly reduced water flow, and inducing silting of the gullies. These are built of piles and sheeting timbers, and are intended primarily as a safeguard in times of future high floods, until a thicket of protecting shrubs and trees can become established both in front of and behind the bulkhead, to provide a heavy vegetative cover. Wherever such a flora existed during the 1940 flood, no damage was caused by the waters pouring over the banks or through existing gullies.

The species of shrub most highly favoured is the Duranta, a well-known hedge plant which thrives in coastal Queensland. The accompanying illustration (Plate 205) shows how well it grows under the dry Burdekin conditions. This is portion of a farm hedge, and had attained a height of about 15 feet. Its virtue in times of flood lies in its thicket growth and especially in the retention of a mass of lower branches and leaves which extend practically to the ground.

Plate 204.
FRONT VIEW OF PARTIALLY CONSTRUCTED BULKHEAD.

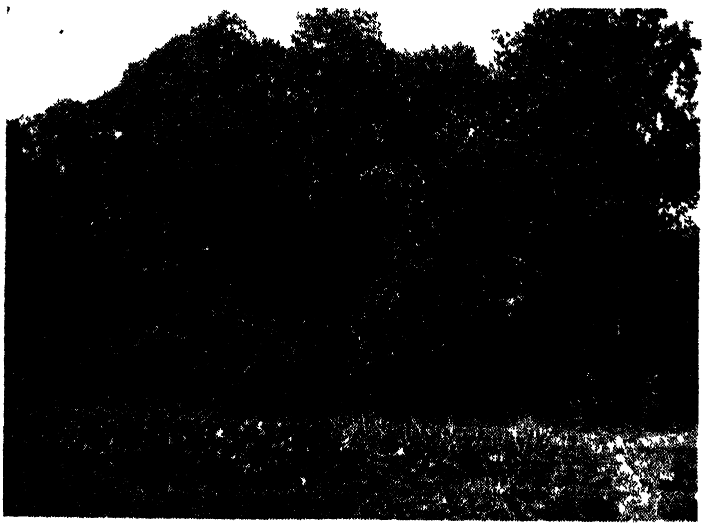


Plate 205.
SHOWING AN OLD DURANTA HEDGE ON A BURDEKIN FARM.

Several thousand cuttings of this species were grown by the Forestry Department, and at the Mackay and Meringa Sugar Experiment Stations, to be transported to the Burdekin and planted several

rows wide along unprotected portions of the banks. Fortunately the rainfall conditions were generally favourable following planting, and the majority of the shrubs should become established.

Plate 206

ILLUSTRATING THE HIGH POWER TRACTOR AND BULL-DOZER ATTACHMENT.

Plate 207

TRACTOR AND SCOOP AT WORK IN THE CONSTRUCTION OF AN EARTH LEVEE

Of special interest was the heavy tractor equipment made available for the construction of the earth levees. The 85 H.P. Diesel tractor (Plate 206) was provided both with bull-dozer, and hydraulically-operated scoop, which had a capacity of 8 cubic yards. It is shown (Plate 207) putting the finishing touches to the first earth levee which was formed on the Home Hill bank. As soon as this job was completed, the

farmer set to work planting all types of grasses or other vegetation which could be expected to grow—anything, in short, which would provide cover and binding power through its root system—in advance of the 1941 wet season. This was successfully accomplished by the aid of irrigation, and in the course of a year or two the more permanent vegetation which has been planted should assure the security of the work.

Plate 208.
THE EARTH LEVEE PRACTICALLY COMPLETED, HOME HILL FARM.

A CHUTE IDEA.

On an Iowa farm is a stationary loading chute built in front of the hog-house door (says an American exchange). As the bottom is loose it is easily changed into an approach to and from the building as shown. When used as a loading chute the outer end is held up by means of a gas pipe slipped through the holes in the legs. By removing the gas pipe the outer end drops and is in position for the approach.

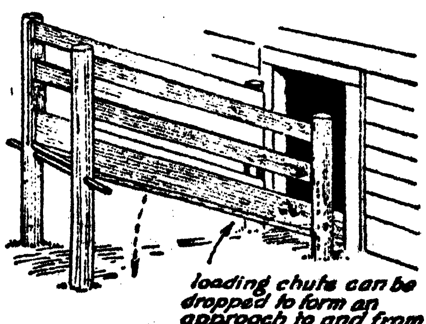


Plate 209.

Cheese Production and Gradings.

G. B. GALLWEY, A.F.I.A., A.A.I.S.

BECAUSE of the importance that cheese has assumed in the changed conditions of the dairying industry, a survey of the yields of cheese and the average test of the milk received at the factory would be useful.

An extension of cheese grading to cover all markets and the recording of results has been welcomed by the industry. Consequently, the first period covered by this survey was the half-year ended the 30th June, 1941, and the results are indicated in the tables that follow.

The sources from which the figures have been compiled are (1) the monthly returns furnished by factories; and (2) the grading reports of State and Commonwealth officers.

It would be well for all concerned with factory management to study the position and ascertain any weakness that may be revealed and consider possible means of putting it right.

In considering the production and yields, variations are noted, and as this is the first survey issued it would be well for factories to keep these particulars for comparison with the results of future surveys.

It is pleasing to observe a big improvement in gradings. While the percentage of choice gradings is not as high as desirable, the lower grades show a considerable decline. It should, obviously, be the aim of every manager to raise the standard of his factory. It might not be out of place to indicate the position to suppliers and obtain their co-operation in improving the grading results of the factory.

SUMMARY OF PRODUCTION AND YIELDS OF ALL CHEESE FACTORIES FOR THE HALF YEAR ENDED 30TH JUNE, 1941.

—	Lb.	—
Milk received	59,584,775	Yield of cheese per 100 lb. milk, 10·44 lb
Cheese made	6,225,996	Yield per lb. of butter fat, 2·72 lb.
Butter fat paid	2,283,742	Average test 3·83 per cent.

GRADES OF CHEESE.

Total.	Choice.	First.	Second.	Third.
3,962,723	308,260 7·79%	2,447,497 61·76%	1,101,436 27·79%	105,530 2·66%

PRODUCTION AND YIELDS OF ALL CHEESE FACTORIES FOR THE PERIOD 1ST JANUARY TO 30TH JUNE, 1941.

RESULTS OF CHEESE GRADED FOR CHEESE FACTORIES FROM 1ST JANUARY TO 31ST DECEMBER, 1940.

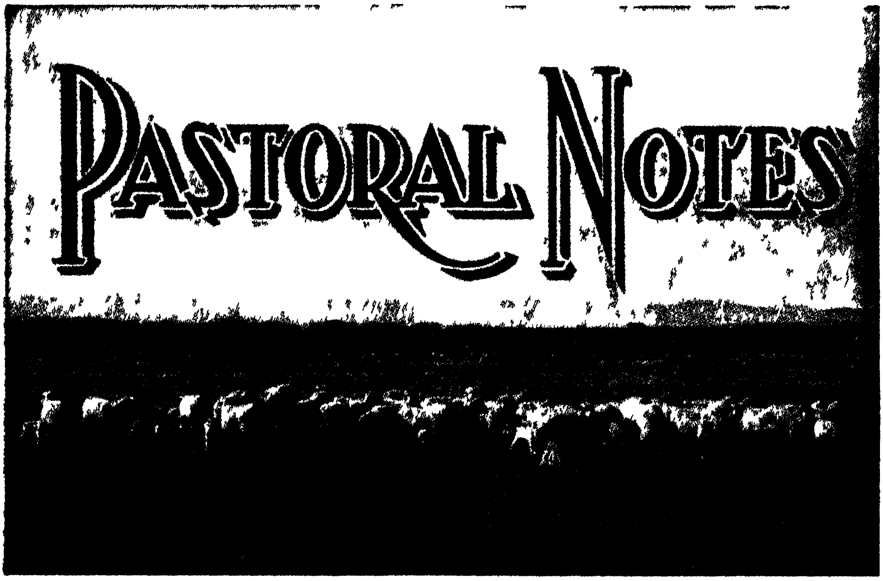
Factory.	Milk Received Lb.	Cheese Yield per 100 lb. Milk.	Cheese Made (Green Weight). lb.	Yield per lb. Butter Fat.	Butter Fat lb.	Average Test. %	Total.	Choice.	First.	Second.	Third.
Aubigny	1,049,241	10·47	109,959	2·79	39,394	3·75	95,270	..	30,609 32·12%	43,128 45·27%	21,533 22·61%
Biddeston	3,602,816	10·81	389,595	2·80	139,029	3·86	296,410	59,206 19·97%	236,604 79·83%	600 ·2%	.. ..
Coalstoun Lakes ..	583,228	10·93	63,780	2·81	22,710	3·89	..	..	..	..	..
Danedale	995,220	9·68	96,311	2·61	36,842	3·70	60,098	..	49,122 81·74%	10,204 16·98%	772 1·28%
Downs	4,057,355	10·39	421,815	2·52	167,334	4·12	179,622	62,768 34·94%	104,924 58·41%	11,930 6·65%	..
Dundanah	893,142	10·57	94,412	2·77	34,041	3·81	10,158	..	..	5,295 52·12%	4,863 47·88%
Felton	1,244,766	11·13	138,553	2·83	49,019	3·94	114,392	..	105,435 92·17%	8,957 7·83%	..
Greenmount	696,077	10·5	73,481	2·68	27,414	3·93	64,849	..	12,375 19·08%	44,694 68·92%	7,780 12·00%
Highgrove	754,339	10·28	77,536	2·81	27,616	3·66	53,244	..	7,462 14·01%	40,343 75·77%	5,439 10·22%
Gomorran	935,871	10·15	95,000	2·52	37,748	4·03	100,197	..	12,245 12·22%	87,952 87·78%	..
Irongate	1,475,393	10·51	155,019	2·74	56,580	3·83	52,188	..	51,240 98·18%	948 1·82%	..
Kooroongana ..	1,733,002	10·44	180,929	2·85	63,460	3·66	180,130	..	170,709 94·77%	9,421 5·23%	..
Lilyvale	653,219	11·04	72,114	2·83	25,486	3·9	14,903	..	5,573 37·39%	9,330 62·61%	..
Malling	1,849,803	9·31	172,191	2·50	68,803	3·72	..	..	..	..	..
Maclagan	2,055,894	10·4	213,789	2·76	77,498	3·77	..	..	..	..	..
Kulpi	1,752,507	10·4	182,240	2·83	64,309	3·66	20,899	..	19,356 92·62%	1,543 7·38%	.. ..
Cooranga North ..	2,174,723	10·32	224,376	2·60	86,295	3·97	210,619	..	39,770 18·88%	170,849 81·12%	.. ..

Moola..	2,595,003	10·43	270,671	2·76	97,048	3·78	239,882	67,896 28·3%	144,214 60·12%	27,772 11·50%	..
Mount Sibley ..	941,262	10·36	97,550	2·65	36,765	3·91	95,934	..	54,611 56·92%	41,323 43·08%	..
Mount Tyson ..	3,253,637	10·69	347,789	2·80	12,009	3·81	202,661	106,825 52·70%	95,836 47·30%	..	..
Kelvinhaugh ..	940,832	9·94	93,472	2·63	35,588	3·78	77,417	..	74,887 96·73%	2,530 3·27%	..
Pittsworth	1,525,854	10·8	164,836	2·71	60,916	3·99	87,419	8,046 9·2%	78,102 89·34%	1,271 1·46%	..
Brookstead	1,101,643	10·73	118,184	2·87	41,145	3·73	66,002	..	61,806 93·64%	4,196 6·36%	..
Linthorpe	1,455,545	10·58	153,945	2·76	55,700	3·83	101,509	78 00·08%	93,920 92·52%	7,511 7·4 %	..
Scrubby Mountain ..	579,950	10·63	61,645	2·82	21,868	3·77	53,682	..	4,564 8·5%	43,745 81·49%	5,373 10·01%
Springside	1,331,221	10·56	140,461	2·89	48,689	3·66	55,645	..	49,261 88·69%	6,384 11·31%	..
Yarranlea	1,270,706	10·36	131,619	2·82	46,673	3·67	110,097	..	67,014 60·87%	40,401 36·70%	2,682 2·43%
College	9,124	9·17	837	2·27	376	4·12	..	..	..	..	..
Quinalow	2,260,597	10·45	236,154	2·8	84,470	3·74	115,179	..	114,052 99·02%	1,127 00·98%	..
Ramsay	1,414,851	10·25	144,988	2·65	54,616	3·86	168,851	..	55,824 33·06%	91,617 54·26%	21,410 12·68%
Rockview	845,450	11·22	94,713	2·7	35,069	4·15	87,671	..	87,071 99·31%	600 00·69%	..
Rocky Creek ..	1,523,625	10·39	158,358	3·06	51,804	3·4	84,222	..	24,372 28·94%	52,832 62·73%	7,018 8·43%
Rosemount	868,737	9·83	85,435	2·74	31,227	3·59	49,454	..	7,323 14·81%	39,381 79·63%	2,750 5·56%
Southbrook	2,075,990	10·44	216,784	2·70	80,301	3·87	195,570	2,490 1·27%	191,757 ..	1,323 00·69%	..
Sugarloaf	1,021,601	10·4	106,630	2·56	41,508	4·00	115,391	..	108,357 93·9%	7,034 6·1%	..
Sunnyvale	1,186,136	10·46	124,107	2·56	48,424	4·08	102,164	..	11,199 10·96%	84,406 82·62%	6,559 6·42%
Greymare	853,077	10·23	87,239	2·61	33,466	3·92	47,830	..	5,952 12·44%	38,147 79·75%	3,731 7·81%

PRODUCTION AND YIELDS OF ALL CHEESE FACTORIES FOR THE PERIOD 1ST JANUARY TO 30TH JUNE, 1941—*continued*.

RESULTS OF CHEESE GRADED FOR CHEESE FACTORIES FROM 1ST JANUARY TO 31ST DECEMBER, 1940—*continued*.

Factory.	Milk Received Lb.	Cheese Yield per 100 lb. Milk.	Cheese Made (Green Weight). lb.	Yield per lb. Butter Fat.	Butter Fat lb.	Average Test. %	Total.	Choice.	First.	Second.	Third.
Lord John Simms ..	391,843	10·34	40,533	2·65	15,319	3·91	4,556	..	..	3,173 69·64%	1,383 30·36%
Talgai	564,984	10·34	58,414	2·79	20,966	3·71	34,397	..	8,645 25·13%	18,043 52·45%	7,709 22·42%
Victoria Hill ..	498,770	10·13	50,533	2·87	17,574	3·52	21,659	..	11,382 52·55%	5,162 23·83%	5,115 23·62%
Wellcamp	1,199,099	10·51	125,986	2·67	47,165	3·93	81,239	..	8,876 10·93%	72,363 89·07%	..
Woodleigh	921,830	10·34	95,318	2·79	34,128	3·7	67,375	..	44,075 65·42%	21,887 32·48%	.. 1,413 2·1%
Yamsion	1,243,504	10·42	129,564	2·72	47,613	3·83	120,281	951 00·79%	94,050 78·19%	25,280 21·02%	.. ..
Yargullen	1,203,308	10·73	129,167	2·76	46,745	3·88	123,657	..	104,636 84·62%	19,021 15·38%	..



Home-made Stock Licks.

GRAZIERS and farmers situated at long distances from manufacturing or distributing centres are often inclined to do without certain aids to progress or use an inferior article on the score of cost. This is well exemplified in the case of licks for stock. Most producers know that salt, lime, and phosphates are the main ingredients of a lick. This has led to a growing tendency to reduce costs by mixing licks on the property, but there still remain some stockowners who use nothing, or perhaps salt alone, when a more complete supplement is required. Where it is possible to obtain wood ash it should be incorporated in the lick. It is not the complete solution of the problem but its use is a decided help—particularly to breeders.

In general the poorer the country the greater the lime content of the ash and the lower the phosphate. There are a few plants which give an ash rich in both lime and phosphate and correspondingly poor in potash. For example, the well known "stinking rodger" gives an ash containing about 16 per cent phosphoric anhydride and 27 per cent lime, while the ash from the blue gum contains 11 per cent phosphoric anhydride and 19 per cent lime. These ashes may represent the greater proportion of a lick. The obvious drawback is the limited quantities obtainable and the difficulty of collection. Grey gum, crow's foot elm, bloodwood, cane tops, and iron bark come next in that order.

Belah, bottle tree, apple tree, box, and tallow wood are very low in phosphate. Belah contains about one-fiftieth of 1 per cent, and must rank as the lowest. This is readily understood when it is remembered that belah will flourish on a soil poor in phosphate. In striking contrast is its [illegible]0 per cent lime content. Ash from tallow wood and gidgee also show a [illegible]0 per cent lime. Their phosphate content ranges from 5 per cent to 1 per cent. Most of the unlisted trees give ashes with a phosphate content of from 1 per cent to 2 per cent.

Collection.—Ashes from the home fires should be collected and stored throughout the year. When practicable, material from burning off should be collected. It should be gathered as soon after burning as possible, because rain soon damages it. The ashes from the burnt sawdust of timber mills are a useful source of cheap material. In short, all available ashes should be kept, for it takes a lot to make a ton and it is a hopeless task trying to get enough ashes just when needed.

Preparation.—Fresh ashes are caustic in nature, but if allowed to age under cover they gradually lose this distasteful quality and, after a few weeks, they may be fed to stock with safety. See that the material is as free as possible

from dirt and antbed. Screen out the coarse charcoal. This may be done easily by setting an old spring mattress at an angle against a wall and shovelling the ashes on to it. The fine ash is collected, and the charcoal returned to the fire or thrown into the pig sty.

Mixing.—No set rule for mixing can be given. The proportions required vary with the composition of the ash. The phosphate-rich ashes may represent as much as two-thirds of the mixture. In the case of low-phosphate high-lime ashes, this proportion usually limits the intake markedly and, consequently, must be altered. Here again a definite figure cannot be given, but 30 per cent. to 40 per cent. may be used, unless experience or supplies indicate to the contrary.

CLASSING THE EWE FLOCK.

Many grazing properties in Queensland are now stocked well up to their carrying capacity, and, with the coming crop of lambs to be provided for, some reduction in numbers will be necessary. It is more profitable to own a flock of good ewes than a flock containing a mixture of good and bad stock. Besides being more profitable, it should give the owner far more satisfaction to have a flock near as possible to uniformity in type and which will cut a heavy fleece of good quality wool.

On most large holdings, crossing the ewe flock forms part of the station routine, and there is no reason why smaller flocks should not be classed in the same way.

Just before shearing is the most suitable time to do the classing and, usually, the flock can be classed in three groups to advantage. The tops should consist of all the large-framed deep-bodied ewes carrying a covering of even type, well grown, and showing the character and colour typical of the breed. Ewes selected for the main flock should be as free from fault as possible, but need not be so even or up to the standard of the tops. The third class will be the culls, including light cutters, ewes producing inferior wools in quality or colour and ewes rejected for defective frames, weak constitution, or objectionable folds or wrinkles. The rams to be mated with them should be classed in the same way, the best being selected for the top line. All culled ewes should be fattened, and sold as soon as possible; the same may be said of those cast for age.

DRUG TREATMENT FOR REDWATER.

There are two kinds of redwater in Queensland. Both are caused by minute blood parasites and are carried by the tick. The differences between these two organisms are so small that they can only be recognised under the microscope. It is impossible to determine which type of redwater is present by an examination of an animal in the field. Fortunately, this is not necessary.

During the last few years intensive efforts have been made to find a suitable drug which would be effective in treatment and yet easy to apply. For many years piroblue held favour. This is effective in the treatment of one kind of redwater, but is ineffective against the other. Unfortunately, the common form in Queensland is unaffected by piroblue. Moreover, piroblue has a great disadvantage in that it requires to be used intravenously—i.e., it must be inoculated into the jugular vein.

Acaprin is now used largely in the treatment of redwater outbreaks, and is known to be effective against both forms of the disease. It is easily applied because the dose is small and it can be injected subcutaneously—under the skin. Supplies of the drug are kept on hand at the Department of Agriculture and Stock and by leading chemists. It is put up in the form of a solution and in single doses.

In areas where redwater is common, owners should keep a few doses of the drug on hand, together with a small hypodermic syringe.

Cases should, of course, be treated as early as possible, but even those which look hopeless at the start will, within an hour or two, show improvement, and so go on to recovery. A second injection can also be given without harming the animal in any way.

Plate 210.

[*Photo.: T. B. Watkins, Blackall.*

DEMONSTRATION SCHOOL ON SHEEP BLOWFLY CONTROL IN THE SHEARING SHED, NORTHAMPTON DOWNS, BLACKALL.—Opening address to assembled stockowners. Other schools have been held at Longreach, Winton, Julia Creek, Charleville, Hannaford, Roma, Goondiwindi, and Dirranbandi.

The Central Queensland group of schools, organised by the Director of Veterinary Services, were conducted by Dr. F. H. S. Roberts, Parasitologist, Mr. G. R. Moule, B.V.Sc., Government Veterinary Surgeon, and Mr. C. J. Swinburne, Sheep and Wool Instructor. Other veterinary and sheep and wool officers are also engaged in the instructional work, as some schools have, necessarily, to be conducted concurrently.

At the Blackall School Dr. J. H. Riches and Mr. Ian Johnstone, B.V.Sc., of the Council for Scientific and Industrial Research Station at Gilruth Plains, assisted in the instructional and demonstrational work.

[Photo T. B. Watkins, Blackall

Plate 211.

A DEMONSTRATION OF SHEEP BLOWFLY CONTROL METHODS IN PROGRESS.

Plate 212.

SHEEP BLOWFLY CONTROL.—A demonstration of the fold removal operation.

[Photo.: T. B. Watkins, Blackall.

[Photo : T. B Watkins, Blackall.

Plate 213.

A SHEEP OWNER UNDERTAKES A DEMONSTRATION.—Sheep blowfly control schools are essentially practical, and pastoralists attending are invited to practice the methods under the supervision of instructing officers so that any fault may be corrected.

Olive Growing.

THE Olive is a native of Asia Minor and also of Africa. Its cultivation is recommended in Queensland principally for parts of the tablelands extending westwards from the Coast Range. Extremes of heat and cold are not favourable to fruit production, and according to experience in other countries a mean temperature of about 60 degrees Fahr. is ideal for its development. It will stand light frosts without injury.

SOILS.

Good sandy and medium loams are the most suitable for growing olives, and good soil moisture is essential. Soils containing plenty of lime and potash are especially suitable.

PROPAGATION.

Propagation may be carried on by means of seeds, cuttings, truncheons, and also by planting suckers, root cuttings, and layers, though the last three methods are rarely used. The most common method is to raise trees from seed and bud these with good varieties. Seeds do not germinate readily unless carefully cracked and the kernels only planted. Spring is the best time for sowing. Specially prepared seed-beds should be used, and the seed should be sown about 2 inches deep. Germination will occur in three to four weeks, and when the plants are 8 to 10 inches high—i.e., when nine to twelve months old—they may be planted into nursery rows. All lateral branches should be removed and straggling roots trimmed. Budding by the "T" method, described in the Departmental pamphlet "Propagation of Fruit Trees," is performed when the plants are in vigorous growth in the spring, with the qualification that the buds should be cut somewhat bigger and longer than citrus buds. Waxed cloth should be used for tying.

Cuttings should be selected during July or August; they require to be 12 to 15 inches long, and should be laid in trenches at an angle of 45 degrees, permitting only the top 3 or 4 inches to remain exposed

above the soil surface. When the cuttings have made a few inches of growth they may be transplanted out. They are usually not as long-lived as seedlings.

PLANTING AND PRUNING.

The plants should be set from 25 to 30 feet apart each way. Pruning should take place from the beginning to induce the "vase" form of pruning adopted for peaches, plums, &c. All unwanted wood should be removed right back to its base. The fruit is borne on two-year-old lateral branches.

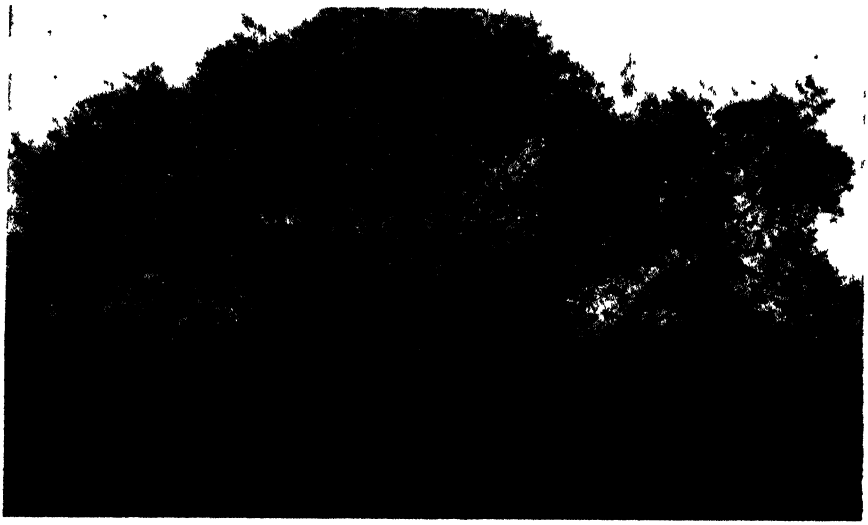


Plate 214.
A WELL-GROWN OLIVE TREE NEAR BRISBANE.

HARVESTING.

The fruit is picked green or ripe according to whether green or ripe olives are required for pickling. Usually the largest olives are selected for pickling, whilst the smaller fruit is raked or shaken from the tree and used for oil extraction.

VARIETIES.

Varieties have not been extensively tried out in this State up to the present, but the following would probably yield good results:—

For Oil—Lucca and Blanquette.

For Pickling—Ascalano and Manzanillo.

Fruitgrowing in the Central-West.

THE Minister for Agriculture, Hon. Frank W. Bulcock, as the representative for the Barcoo Electorate, knows from personal experience and long residence in the West, the necessity for fruit in the dietary of the people in the Great Outback. He knows, also, how expensive it is for people to purchase fruit which has had to be transported long distances from coastal fruit districts and that, for this reason, it is not eaten as extensively as it should be.

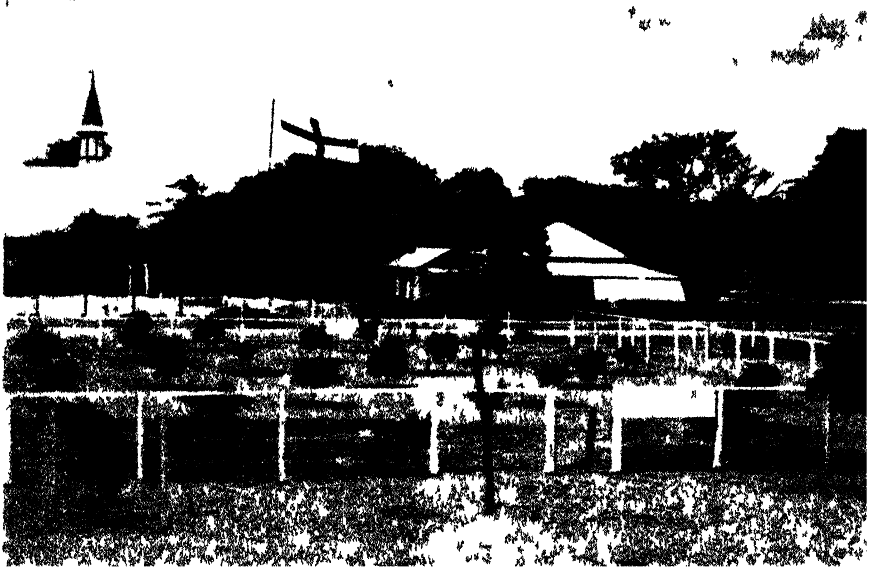


Plate 215.

ORANGE GROVE ESTABLISHED BY THE SCHOLARS' CITRUS PROJECT CLUB IN THE GROUNDS OF THE BARCALDINE STATE SCHOOL.

The obvious solution is for Western people to grow their own fruit, and Mr. Bulcock has made every effort to foster "orchardmindedness" among far inland dwellers. As a result of this close interest, in addition to that of the officers of his own Department, large acreage of citrus trees—and also of bananas, mangoes, dates, pineapples, and papaws—have been planted in the West. Enthusiastic masters of the Barcaldine and Blackall State Schools have added impetus to the departmental effort by establishing citrus groves in their school grounds to inculcate the principles of fruitgrowing in a practical way. The accompanying photographs illustrate the keenness of Western children, who are made responsible for the care of their own school ground groves, which are kept clean of weeds, regularly cultivated and watered, and pruned by themselves under the guidance of a departmental field officer.

Incidentally, the photographs also serve to show very strikingly the remarkable rate of growth of citrus fruit trees in the West. The trees were planted in August, 1940, and had attained a height of 5 feet after only fifteen months of growth.

The bananas illustrated are growing along a bore drain in the Blackall district.

Plate 216.
ANOTHER VIEW OF THE BARCALDINE STATE SCHOOL ORANGE GROVE, SHOWING THE REMARKABLE GROWTH OF THE YOUNG CITRUS TREES, 15 MONTHS AFTER PLANTING.

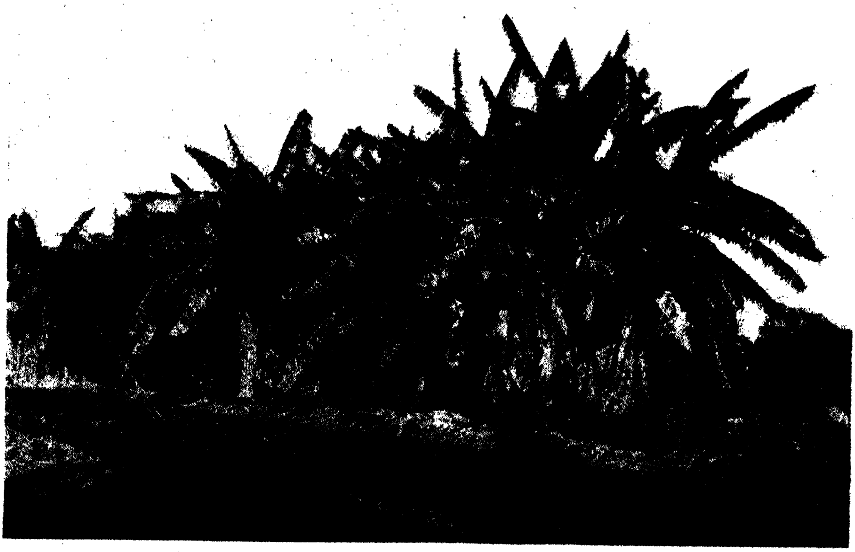


Plate 217.
A BORE DRAIN BANANA GROVE AT BLACKALL.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

MARKET conditions in all capital cities are now undergoing a great change as hot summer conditions become more regular in their development. Growers sending fruit to distant markets should now harvest fruit in less advanced and coloure condition. Examination of papaws and pineapples on the Sydney market during the last week of November revealed that many lines were in too far an advanced condition to allow fruit to be held on the sections against a possible higher price. Advanced lines must be sold immediately they arrive on the market section, as it is a better policy for a salesman to take a lower price and get out quickly than to push the fruit going off while holding it for a higher price. When any fruit becomes overripe, it has to be sacrificed for what is offered, usually to the barrowmen, whose buying rates are low. Water blister and yeasty rot made an unwelcome appearance in the middle of October. Practically all specimens found were affected at the base. If growers intend to get the best values for their pines on distant markets they will have to cut fruit and leave a small end of stalk projecting beyond the base to keep the fruit from contact with the sides of the box. Separating the coloured from the partly-coloured fruit is also a necessity. This enables the country-order buyer to select less coloured fruit which will carry a distance, instead of mixed coloured fruit with a risk of its going off before the consumer gets it. The importance of better handling and proper packing practice is again strongly stressed.

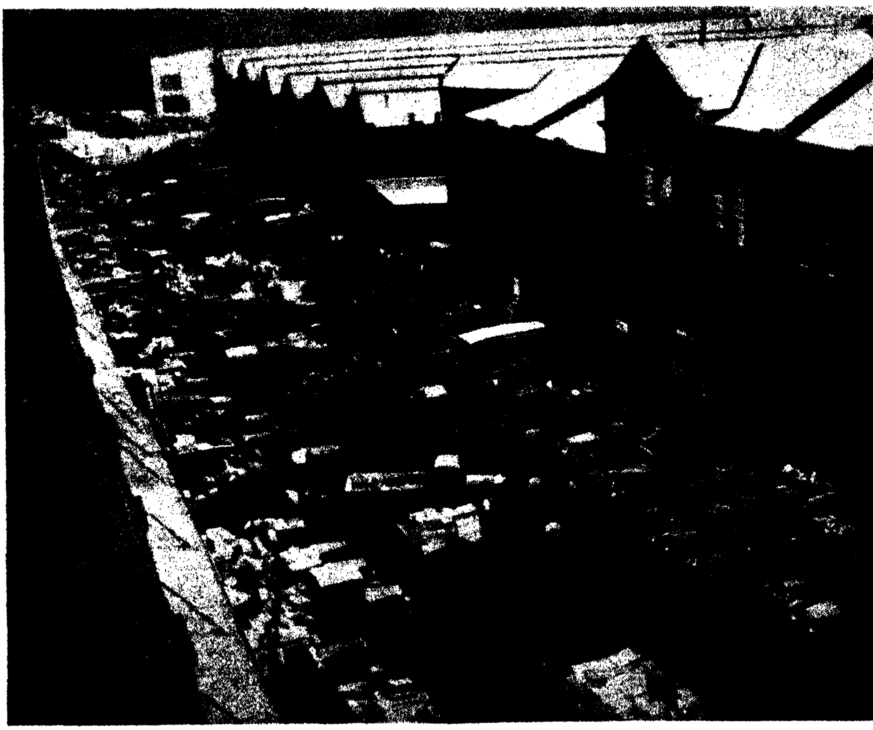


Plate 218.

A "QUIET" MORNING AT THE SYDNEY MARKETS.

Prices during the last week of November were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Sixes, 7s. to 10s.; Sevens, 9s. to 12s.; Eights and Nines, 10s to 15s.

Sydney.—Cavendish: Sixes, 10s. to 14s.; Sevens, 13s. to 16s.; Eights and Nines, 16s. to 18s.; specials higher.

Melbourne.—Cavendish: Sixes, 7s. to 10s.; Sevens, 9s. to 12s.; Eights and Nines, 11s. to 14s.

Brisbane.—Cavendish in bunches, 2d. to 9d. dozen.

Brisbane.—Sugars, 3d. to 6d. dozen; Lady Fingers, 2d. to 1s. per dozen.

Pineapples.

Brisbane.—Smooths, 4s. to 8s. case; loose, 2s. to 6s. 6d. dozen. Roughs, 8s. to 11s. case; loose, 1s. 6d. to 5s. dozen.

Sydney.—South Queensland, 7s. to 10s.; North Queensland, to 14s.

Melbourne.—8s. to 12s.; special packs, to 13s.

Adelaide.—11s. to 14s.

Papaws.

Brisbane.—Locals, 2s. to 3s. 6d. bushel; Yarwun, 5s. to 9s. tropical case; Gunalda, 4s. to 5s. bushel.

Sydney.—6s. to 12s.; specials, to 15s. tropical case.

Melbourne.—10s. to 16s.

Apples.

Brisbane.—New season's Stanthorpe Lord Nelsons, 16s. to 20s. bushel.

Mangoes.

Brisbane.—Commons, 9s. to 11s.; specials, 12s. to 14s.

Sydney.—Some lines of commons were seen, this type is practically unsaleable. Special varieties, to 24s. case.

OTHER FRUITS.

Avocado.

Sydney.—Supplies of this fruit have practically ceased. Prices to 14s. would be obtained for good sound lines.

Rockmelons.

Brisbane.—7s. to 9s. bushel case.

Sydney.—To 12s. bushel case.

Melbourne.—14s. to 16s. bushel case.

Passion Fruit.

Brisbane.—Firsts, 8s. to 12s.; Seconds, 5s. to 7s.

Sydney.—10s. to 14s.; specials, to 18s.

Melbourne.—12s. to 20s. half bushel.

Tomatoes.

Brisbane.—Coloured, 3s. to 8s.; Ripe, 3s. to 6s.; Green, 3s. to 7s.

Sydney.—South Queensland, 6s. to 8s.; few specials, to 10s.

VEGETABLES.

(Brisbane prices only, unless otherwise stated.)

Beans.—Brisbane, 5s. to 8s.

Peas.—Brisbane, 7s. to 12s.; inferior lines lower.

Cabbage.—Locals, 6d. to 4s. dozen; Stanthorpe, 4s. to 7s. bag.

Carrots.—3d. to 2s. 6d. bundle.

Beetroot.—3d. to 1s. bundle.

English Potatoes.—2s. 6d. to 7s. sugar bag.

Sweet Potatoes.—3s. 6d. to 4s. 6d. sugar bag.

Cucumbers.—Brisbane, 2s. to 3s. bushel; Melbourne, 6s. to 10s.; Sydney, 6s. to 8s.; specials, to 12s.; inferior unsaleable.

Rhubarb.—9d. to 1s. 3d. bundle.

Chokos.—9d. to 1s. 6d. dozen.

Marrows.—Brisbane, 1s. to 3s. dozen; Melbourne, 8s. to 10s. case; Sydney, no demand.

Lettuce.—1s. to 2s. 6d. dozen.

Pumpkins.—Brisbane, 15s. to 17s. cwt.; Sydney, 18s. to 22s. bag.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled during the month of October, 1941 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (STANDARD, 350 LB.)			
Model of Alfa Vale	W. H. Thompson, Nanango	11,470·75	564·328	Greyleigh of Greyleigh
Merrivale Tulip 4th	W. Soley, Malanda	13,944·2	512·043	Greyleigh Honorarium
Pilton View Cora	P. D. Fiechtner, Pilton View, via Greenmount	9,909·5	396·935	Sunrise 3rd of Rosenthal
White Park Thelma 13th	W. T. Savage, Barnesmore, via Toowoomba	8,856·25	359·212	Corunna Viscount
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Vision 20th of Meadow Vale	W. J. Freeman, Trevlac, Rosewood	6,986·9	291·680	Triumph of Park View
Pilton View Venus	P. D. Fiechtner, Pilton View, via Greenmount	7,420·00	289·506	Navillus Venies Sheik
Trevor Hill Dove 2nd	G. Gwynne, Umbiram	7,039·59	288·997	Corunna Supreme
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Cedargrove Irene 25th	P. D. Fiechtner, Pilton View, via Greenmount	8,038·5	307·805	Cedargrove Windlad
Murrays Bridge Roanie	P. D. Fiechtner, Pilton View, via Greenmount	7,146·00	264·686	Murrays Bridge De Valera's Pride
Pilton View Lola	P. D. Fiechtner, Pilton View, via Greenmount	6,614·5	254·221	Navillus Venies Sheik
	JERSEY.			
	JUNIOR, 4 YEARS (STANDARD, 310 LB.).			
May of Gem	W. Bishop, Kenmore	8,569·75	487·945	Laces Volunteer of Ardroy
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Grasmere Calm 22nd	W. Davis, Brisbane road, Redcliffe	7,463·00	357·524	Grasmere Duke
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Inverlaw Wild Rose	E. Matthews, Yarraman	5,516·25	259·058	Oxford Royal Lad
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Lermont Golden Pearl	J. Schull, Oakey	5,959·2	326·061	Woodside Golden Volunteer
	FRIESIAN.			
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Rockview Secret	J. P. Larson, Miriam Vale	7,430·95	261·508	Ryefield Curtis

General Notes

Staff Changes and Appointments.

All field officers of the Department of Agriculture and Stock have been appointed also local supply officers under the *National Security (Emergency Supplies) Rules* of 1941.

The underlisted officers of the Department of Agriculture and Stock have been appointed also inspectors under *The Tobacco Industry Protection Act* of 1933:—

> Messrs. C. H. P. Defries, Instructor in Agriculture, Ayr; G. W. Smith, Instructor in Agriculture, Toowoomba; E. W. Baird, Instructor in Agriculture, Atherton; L. Wood, Field Officer (Silo Construction), Brisbane; J. McAully, Field Assistant, Rockhampton; C. E. Whitehead, Field Assistant, Mareeba; E. McDonald (South Johnstone), and J. Hart (A.I.F.).

Mr. A. K. Sutherland, B.V.Sc., Department of Health, Canberra, has been appointed to the Veterinary Staff of the Department of Agriculture and Stock, Brisbane.

Mr. S. M. Staines, Jamberoo, Taroom, has been appointed an honorary inspector of stock.

Messrs. J. W. Fleming (Mount Merchinson, Biloela) and W. C. Paroz (Le Nid, Biloela) have been appointed honorary protectors of fauna.

Constable P. E. O'Brien (Leyburn) has been appointed also an inspector under *The Slaughtering Act.*

Stanthorpe Fruit and Vegetable Levy.

The Stanthorpe Fruit and Vegetable General Levy Regulation, published in April, 1936, and extended from time to time, has been further extended for a period of two years from 24th December, 1941.

An amendment has been made in respect of the altered weight which now operates for apples—viz., 45 cases instead of 40 cases to the ton.

The levy is at the rate of 3s. 4d. per ton on fruit and/or vegetables despatched by rail or road, and all sums raised by the levy are expended only in the interests of the fruit and vegetable growers in the Stanthorpe area.

Price of Arsenic Pentoxide.

The Prickly-pear Land Commission has notified that as from 1st December, 1941, the price of arsenic pentoxide will be increased from 7s. 6d. to 8s. 9d. per 20 lb. tin. Railage is free to purchasers within the State. The reason for the rise is an all-round increase of materials and production cost. The new price is the actual cost to the Department of Public Lands.

Unauthorised Introduction of Animals and Birds—Danger to Australia.

It is probably not generally realised that in so far as the major animal plagues are concerned, Australia is not only remarkably free but that many of these diseases have never obtained a footing here. Some, such as Rinderpest and Fowl Pest, have gained access in times past, but were speedily eradicated; only, however, at some cost.

As diseases we fear are present in South-Eastern Asia and the islands between there and Australia, there is an ever-present risk of their introduction, this being guarded against by strict regulations under the Commonwealth Quarantine Act.

In some of these diseases the position is rendered more difficult by reason of the fact that apparently healthy animals may be "carriers"; whilst in the case of rabies, a dog may be affected for several months before developing symptoms. For these reasons the introduction of such animals as dogs and birds from these countries is prohibited.

Movement of troops has not infrequently been accompanied by spread of disease, largely owing to difficulties of ensuring proper restriction of movement of animals which may convey disease, and, therefore, the quarantine authorities ask that the attention of not only the general public, but especially of soldiers, sailors, and airmen be drawn to the risk from the unauthorised introduction of animals and birds from foreign countries.

Plate 219.

THE BROAD WATERS OF THE DAINTREE RIVER, ONE OF NORTH QUEENSLAND'S FINEST STREAMS.—On the bank of the Daintree is a wealth of jungle land, a potential source of rich tropical production. Dairying is already an established local industry, and butter from the Daintree Factory has achieved a reputation for quality although produced in the torrid zone. Beef cattle fattening is another well founded Daintree District enterprise. A good road connects Daintree with Mossman, Queensland's most northerly sugar town, possessing many modern social amenities. The Cook Highway—one of the finest coastal roads in the Commonwealth—provides rapid communication with Cairns, the thriving commercial and social centre of the rich lands north of Townsville.

Answers to Correspondents

VETERINARY ADVICE.

(*Selections from the outgoing mail from the office of the Director of Veterinary Services.*)

Calf Poisoning (Pepperina)—Fistula—Cause of Cow's Death—Castration of Pigs.

H.H.T.—

Poisoning of poddy calf with pepperina leaves.—The calf should be given a purgative, and it is suggested that it be given 4 to 8 oz. of Epsom salts, the dose, of course, depending on the size of the animal. A well-grown calf up to a year old would take very nearly a ½ lb. Epsom salts should be dissolved in about a pint of water, which is sufficient to fill a beer bottle. To this might be added a level dessertspoonful of ground ginger.

Fistulous wither.—Usually this condition does not clean up unless it is treated surgically, and even then great difficulty may be experienced. Probably the best advice is to obtain the services of a qualified veterinary surgeon to attempt the job for you.

Death of cow.—From the description given, it is apparent that the animal died of Traumatic pericarditis. This is brought about through the animal swallowing a foreign body which is sharp or pointed. It lodges in the second stomach or honeycomb, and with the movement of the stomach penetrates the wall of the stomach, passes through the diaphragm or skirt and enters the heart. Once the condition develops little can be done to alleviate it.

Castration of pigs.—If you send your name and address information on this subject will be given.

Mange Mites.

A.W.B. (Nerang)—

The fluid you have in mind is probably lime sulphur wash. This is effective against mange mites.

It is not very useful against lice; nicotine sulphate is used for that purpose.

Lime sulphur wash is prepared as follows:—

Take 1 lb. slaked lime and mix to paste with water, sift in 1½ lb. flowers of sulphur, and add 2 gallons of water. Boil for two or three hours until golden or amber colour. Then allow to stand, and take off the clear liquor on top. Add water to this to bring it up to 6 gallons. Use two parts of this stock solution to seven parts water to wash the horse thoroughly.

Repeat this treatment in three weeks' time.

Mammitis.

A.M.C. (Tully, N.Q.)—

There are various methods whereby a cow may contract mammitis. Present knowledge on this point is still rather confused. It may be contracted through the canal of the teat, especially where sanitary methods of milking—such as washing the udders and hands, clean uddercloths and water—are not practised.

When not kept scrupulously clean, milking machines are frequent causes of infection. Where any cows are known to have mammitis they should be milked last, and always hand milked into a bucket of disinfectant. Flies have been proved to carry the infection from one cow to another. Where this is suspected, the udders should be wiped after milking as well as before.

The first obvious signs of mammitis are frequently minute specks of white matter in the milk. These are most easily seen by milking on to a black surface. This is frequently followed by an intense inflammation of the udder, which becomes tense, swollen and hot. The milk may become thin and watery or cheesy.

Vaccination, combined with local treatment of the udder, is the best method of treatment. A U.S.C. pamphlet explaining the treatment in detail has been posted to you.

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

"Native Pomegranate."

J.R.B. (Toowoomba)—

The specimen from the range below Toowoomba is *Capparis Mitchellii*, a tree with a very wide distribution in Queensland and commonly known as Native Pomegranate. It is also called Bumble Tree and Wild Orange; the last name, however, is commonly given to a number of native plants.

It is well worth growing locally. It is ornamental and when well grown has a shapely top. The flowers are large and conspicuous. The fruit has a very pleasant odour and was eaten by the aborigines.

Bats' Wing Coral Tree. Flame Tree.

L.D. (Lowood)—

1. *Erythrina vespertilio*, the Bat's Wing Coral Tree. This tree has a wide distribution in Queensland from the coast to the far interior, and because of the lightness of its timber, it is often called Cork Wood. It is quite distinct from Duboisia and the leaves have no commercial value.
2. *Sterculia acerifolia*, the Flame Tree. This plant belongs to the same family as the Kurrajong and Bottle Tree. It is a very handsome tree in flower. The leaves do not possess any commercial value.

It is doubtful if Duboisia occurs in your locality.

Cestrum—Poisonous to Stock.

D.C. (Toogoolawah)—

The specimen is the Green Cestrum (*Cestrum Parqui*), a native of South America, now a naturalised weed in Australia. It is very common in vacant allotments around towns. It is difficult to eradicate because of its suckering habit. It is very poisonous, and has caused death among town cows about Brisbane and elsewhere.

Carpet or Mat Grass.

T.R. (Merriwinni, via Cairns)—

The specimen is Carpet or Mat Grass (*Axonopus afflnis*). There has been much controversy about this grass during recent years because it is inferior in quality and likely to invade first-class country. On second-class country, however, we think it has a decided value. It thrives on low, somewhat swampy land of rather poor quality, where other grasses will not grow.

It was originally boomed as a fodder under the name of *Paspalum compressum*, and is, perhaps, the grass you sowed some years ago. It is closely allied to the Buffalo Couch of North Queensland.

Twiggy Mullein, a Common Weed.

Inquirer (Boonah)—

The specimen is the Twiggy Mullein (*Verbascum virgatum*), a native of the Mediterranean region, now a fairly common weed in Queensland. It was probably introduced originally as a garden flower. Although a weed, it has not shown itself to be a particularly aggressive one.

"Sausage Tree" or The Sacred Tree of Nubia.

J.L.C. (Lower Cowley, via Innisfail)—

The specimen is the Sausage Tree, *Kigelia pinnata*, a native of Africa. It is sometimes called the Sacred Tree of Nubia. Sausage tree, however, is the generally accepted local name. There are several examples in the Brisbane Botanic Gardens, and in a catalogue of the Gardens published by the late F. M. Bailey some years ago he says:—

"In Nubia this tree is held sacred; the negroes celebrate their religious festivals under it by moonlight, and poles made of its wood are erected as symbols of special veneration before the houses of their great chiefs. The fruit, cut in half and slightly roasted, is employed as an outward application in rheumatic complaints."

Rural Topics

Rust can Ruin Farm Implements.

Although rust is often accepted as a matter of course, there is much that can be done to prevent it, and, if necessary, to remove it, without damage to the implement.

In repairing machines that have been lying in the field, rusted nuts that cannot be removed with a spanner are the first trouble to be noticed. This is an easily seen example of the bad effects of rust, but rust also reduces the working efficiency of machines in less obvious ways.

For instance, lorry springs rusted between the leaves do not do their job of smoothing out shocks. Moreover, the springs may break under a heavy load, because the leaves of a rusted spring cannot slide over each other to allow the spring to bend. Cog wheels and levers on drills and distributors cannot work smoothly if their iron-to-iron bearing surfaces are rusty.

SOFTEN BEFORE CHIPPING.

Rust can be chipped away, or filed away, or rubbed off with emery paper. All this, however, takes away some of the good metal as well as the coating of rust. Often this does not matter, but sometimes, as in the case of a spindle and bearing, it may make the parts a sloppy fit when they are put together again.

Penetrating oil will soften the rust so that it can be chipped off more easily, and this will reduce the chipping away of the iron itself.

Penetrating oil will soften the rust, loosening rusted-on nuts. It should be squirted round the exposed threads of the bolt close against the nut and left for an hour or so to seep along the threads inside the nut.

For more delicate machine parts whose fit must not be upset by chipping and filing, it is better to dissolve the rust chemically. Each article to be cleaned must have a small contact place filed on its surface. A thin band of zinc is wrapped round the article to touch this clean place. Then the articles are placed in a trough containing a solution of 2 lb. of caustic soda to each gallon of water.

They should be left in the solution for forty-eight hours. At the end of that time the rust will be in the form of a coating of black powder, which can be rubbed off easily with a wire brush.

An old sink is very suitable for holding the solution. Caustic soda burns the skin of the fingers, so it should be handled carefully. Tongs can be used to place the articles into the solution.

PRESERVE WITH PAINT.

When the iron or steel has been cleaned it ought to be treated to prevent it from rusting again. Oil, where it can be kept in contact with the surface of the metal and does not get washed off, is a good preserver.

But oil gets rubbed and washed off exposed pieces of iron, and—although it is difficult in some cases—they must be preserved by painting. The surface must be clean, and especially it must be dry and free from grease.

New steel that has been rolled in a mill is covered with a bluish-grey film. This film is really a layer of fine scale. In a few months' time this scale flakes off and takes with it any paint that was applied to the new steel.

This film can be removed by pickling the steel in acid, but this is not a process to be carried out on a farm. The best thing to do is to leave the steel article unprotected in the atmosphere until it acquires a thin coating of rust. Then this coating can be rubbed off with a wire brush and a good painting surface will be exposed.

The best paint for machinery is red lead paint.

For many structures, such as steel stanchions and fence posts, bitumen paint is a fine preservative. Also a very satisfactory paint for steel and iron can be made by mixing two parts of tar with one part of paraffin. The mixing is laborious and it must be done very thoroughly; but the result is a paint that covers well and dries hard.

MAKE NETTING LAST LONGER.

The life of galvanised iron wire-netting and pipes and guttering can be greatly extended by an application of a hot mixture of five parts of tar and one part of pitch. A new galvanised surface, however, does not take any paint or tar mixture readily. Moreover, like the film on new rolled steel, the outer surface of the galvanising flakes off in the first few weeks of use. It is well, therefore, to let the galvanised iron weather a little before it is painted.

When it is essential for the new galvanised iron or steel to be painted immediately, the surface ought to be treated first with a solution of 8 oz. of copper sulphate and 1 oz. of sulphuric acid in a gallon of water. This solution should be left on the article for two hours. Then the article should be washed with water. When it has dried it can be painted satisfactorily.—*The New Zealand Farmer Weekly.*

The Problem of Prices.

Deep thinkers see behind the problem of prices a definite moral issue. There are some who argue that right through recurring depressions our troubles have largely been a question of morals, and they're probably right. We talk about money and credits and production and distribution—morals underlie all of them. We had a world, we thought, organised on a moral basis, but apparently we've run short of morals, just like a cash business running out of cash. To moralise further, nothing great or worth while is easy. And just to amplify that idea, let it be said that the names of those immortals splashed over the pages of history are not the names of those whose lives were easy or particularly happy. Happy lives—in the very ordinary sense of creature comfort or holding winning casket tickets—never made history. The names which are etched indelibly on the tablets of the human race and sung by the poets of all nations are the names of ''the men of sorrows who have known grief.''

For the farmer on whom the problem of prices weighs heaviest, there may be some spiritual comfort at least in that reflection; and also in the knowledge that the reward of the industrious is not ease—it couldn't be. The reward of the industrious is more work and more responsibility, and for the farmer, very often, lower prices—unless he's on the Lockyer growing onions under irrigation in a dry time.

Old-Time Sailing Ships Gave Britain War-time Cattle Fodder.

Seeds accidentally taken to England last century in the holds of American sailing ships have given Britain's farmers a valuable war-time cattle fodder.

It is rice grass, or *Spartina townsendii*, a plant flourishing on coastal mud-flats or river estuaries, where it prevents the washing away of banks by the action of tides and currents. Much rice grass has spread naturally, but in recent years extensive plantations have been made for coastal protection.

The modern English variety, discovered at Hythe, in Southampton water, in 1870, is a cross between the native species and that brought from America, and is so vigorous that whenever it comes into competition with either of its parents it eliminates them completely.

Agricultural experts who have carried out cattle-feeding trials with rice grass have found that under good conditions it makes splendid hay. It is also grazed readily by all classes of livestock.

In New South Wales rice grass has been planted as fodder in the extensive saltlands of the Riverina district, where it absorbs the overflow from artesian wells.

Experiments with it are also being carried out in South Africa, India, and the Sudan.

Farming is a Complex Business.

Those who do not know anything about farming little realise that farming is one of the most complex of businesses. But at the same time it can be described very simply: It is the process of converting cheap, crude chemicals into valuable refined products and selling the latter to somebody at a profit. These chemicals must be bought or taken from the air. There is a moderate amount of them stored in the soil on every fertile farm, but this is in the nature of a reserve. If drawn upon it must be replaced. If not replaced, the enterprise is no longer farming but mining, and will presently go bankrupt. Apply these simple principles to every branch of agriculture and you will find no exceptions. No matter what your product, it is the result of running crude chemicals through a converting process and selling the product.

Farm Notes

JANUARY.

THE heaviest rains of the year occur usually during the January-March period, and, weather conditions permitting, the main field activity for the month will be the preparation of land for autumn and winter crops, together with the scarifying and chipping required for existing row crops.

In all districts where wheat, barley, canary seed, and oats have been harvested, ploughing should be continued in order to conserve moisture for the succeeding crop, and to eradicate troublesome summer weeds.

Early ploughing ensures the accumulation of subsoil moisture, which is invaluable in promoting the growth of winter cereals, at a time when seasonal rainfall is often deficient. The practice of early ploughing is recommended, especially to dairymen outside the wheat areas who normally sow oats, barley and wheat for green feed.

Land intended for the February potato planting will now be in an advanced stage of preparation. The selection of whole seed from disease-free crops is recommended for autumn planting, as losses may occur from rotting if hot, wet conditions prevail after the planting of cut sets. Very small whole potatoes, less than 2 inches in diameter, are not likely to give the same results as more robust potatoes.

Succession sowings of summer fodder crops—such as sorghum (saccaline, white African, and imphee), Sudan grass, white panicum, Japanese millet, and cowpea may be continued where land is available. Maize sowing may also be completed in districts where early frosts are not the usual experience, but preference should be given to early-maturing or mid-season varieties.

Full advantage should be taken of the opportunity to arrange for the adequate conservation of fodder during the summer growing season, when the production of bulky, green crops presents no great difficulty.

Well-grown crops of maize and the sweet sorghums cut at the right stage of growth and before full maturity will make excellent silage which may be economically conserved in pit, trench, stack, or overhead silo. Surplus green grass, and many other green crops also, will make satisfactory silage for winter feed, and as a reserve for dry periods. Many dairy farmers prefer to rely on a continuity of green fodder crops throughout the year, but provision also should be made for conservation, for if pastures are scarce because of dry conditions, crop growth is then also at a minimum.

January is usually a favourable month for the sowing of paspalum, Rhodes, and other similar grasses in districts suitable for their growth. Recently burnt scrub land or thoroughly cultivated areas provide a good seed-bed, given sufficient moisture, but care should be taken to ensure that the germination standard of the seed is sufficiently high, as a good cover and rapid early growth is the principal factor in keeping weeds and undergrowth in check.

All harvesting machinery should be placed under cover. Repairs and adjustments may be regarded as wet-day jobs.

Orchard Notes

JANUARY.

THE COASTAL DISTRICTS.

ORCHARDS and plantations should now be carrying a good cover crop, which will help to check erosion during the wet season and, when cut and turned under, maintain the soil in good physical condition.

Pineapple plantations should be kept well worked.

Bananas and pineapples may still be planted, although it is somewhat late for the former in the southern parts of the State. It would be wise to keep a good lookout for pests of all kinds, including maori on citrus trees, scale insects, leaf-eating insects, borers, and fungus pests generally, using the remedies recommended by the Department of Agriculture and Stock.

Care is advised in handling and marketing of all kinds of fruit.

Grapes are in full season, and in order that they may be sold to advantage they should be very carefully handled, graded, and packed, as their value depends on the condition in which they reach the market. Well-coloured, mature fruit, with the bloom on and without blemish, always sells well. One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe. A maturity standard for grapes is now in force and immature grapes are liable to condemnation.

Bananas for the interstate trade should be well filled, but showing no sign of ripening. The fruit should be carefully graded and packed and the cases marked in accordance with the prescribed regulations and despatched without delay.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Stanthorpe district, and orchardists will be fully occupied gathering, packing, and marketing the crop of mid-season fruits.

Much of the fruit may not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District; and, if they are carefully selected and properly graded and packed, they should carry as far as Cairns.

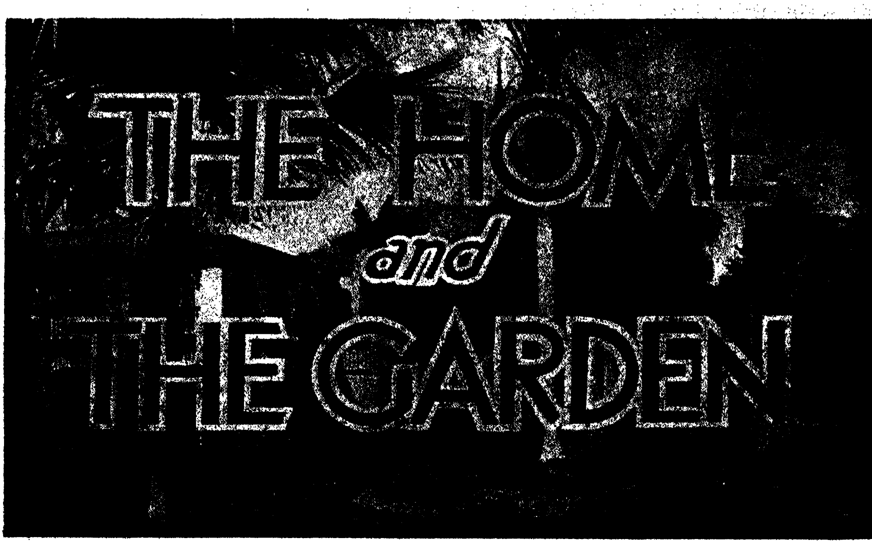
Points to remember—

- Fruit should be fully developed, but quite firm when gathered.
- It should be handled carefully. Bruised fruit is spoilt fruit.
- Only one-sized fruit, of an even degree of ripeness and colour, should be packed in a case.
- Fruit should be so packed that it will not shift, for if it is packed loosely it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

BRITAIN NEEDS CHEESE.

The vital importance of the drive for the production of as much cheese as possible, which has been going on vigorously over the Darling Downs, is indicated very strikingly by an extract from a cheerful letter from a New Zealand dairy instructor and grader who is now in the Old Country and who has been through recent air raids.

Among other things, this is what he says:—"Cheese is the best substitute for meat, and at present is a far more important item of diet than butter. If our dairy farmers in New Zealand—and Australia, too—could fully appreciate the need for more cheese, I feel sure that they would gladly make what comparatively small sacrifice this involves by having their milk converted into cheese instead of butter."



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

CARE OF MOTHER AND CHILD.

A TALK ON THE MANAGEMENT OF THE TODDLER.

OUR talk this month is for fathers as well as mothers, and we hope that all fathers will read it. In the pre-natal period, when the baby is being built up inside the body of the mother, and later after baby is born and in his first months of complete dependence, it is usually the mother who is almost entirely responsible for his care. Nature has decided that the place of the mother is in the home, and, although maternity does not endow a mother with all the necessary knowledge for bringing up a child, she does endow her usually with the adaptability for handling, and in short "mothering" the tiny helpless infant. We have met fathers who have also proved quite expert at this stage of baby's life, but his job at this period is usually the care and protection of the mother. When baby is over one year old, and has become what is known as a toddler, or in more up-to-date parlance, a pre-school child, the position does or should alter somewhat, and father should come forward and take equal share with mother in the care and management of his child at this difficult and often neglected stage of development. This applies very particularly where the child is a boy. Nowadays parents may obtain expert help in child management from trained Child Welfare nurses, kindergarten teachers, dental clinics, and hospitals and doctors—all ready and eager to help in the special aspect of child care with which they are most familiar.

Before birth the mother nourishes the baby's body from her own blood stream; after birth she not only continues to nourish his body but trains and develops his mind. As the child grows then, both parents must help to develop that mind and body so that a character will be formed which will stand baby in good stead all the rest of his life. It is this "sharing" in the work of child management which should make parenthood such an interesting and satisfying part of life. Although baby is born with certain character traits his character is not formed. He has a mind and a brain, the working of which must be guided into the right channels. This talk is meant to help parents with that guidance.

In life everything works in a circle; leave out one part of the circle and the life is incomplete. Surrounding a baby there should be a complete circle of love and care made up from twelve carefully thought-out points. These are:—Fresh air,

correct food, pure water, bathing, general cleanliness, muscular exercise, and sensory stimulation, correct clothing, warmth, mothering, management, regularity, and sufficient rest and sleep. Properly carried out this "care circle" will help the child to healthy happy childhood and the development of a sound adult personality. Parents must endeavour to build up a feeling of confidence and security round their children. Most problems of childhood, such as temper, tantrums, bed-wetting, thumb-sucking, and various fears are caused by the child's lack of confidence in the people who are handling him. Commence with good mothering, the first essential for confidence. Mother love is usually born with the child, but it must not be separated from its partners—common sense and good management. It is unwise to accede to the child's every whim because you cannot bear to thwart him. Have as few "don'ts" as possible, but having decided that those few are necessary for the child's protection and development, abide by them. Start carefully, and as you mean to carry on.

Regularity of routine is good and gives a sense of security as long as the child responds to it happily. If he does not you should seek advice from a qualified person. Remember, however, that good habits are as easy to establish as bad ones.

The habit of cleanliness is fairly easy to teach because children are good imitators and will do with great pleasure all the things mother and father do; washing hands before meals and after returning from the lavatory; taking delight in clean fresh clothes and in fresh air, the daily bath and cleaning teeth, and so on. All these can be quite simply taught to the child by father and mother's own example.

Play outdoors is the best exercise for a child, and the toys he uses should be chosen carefully so that they educate his eyes and muscles and train his memory. They should be used to teach colour, balance, vision, and the limits of his own safety. Teach him to know about the growth of plants and trees, animals, and insects; let him handle them and be interested in them. He will never be cruel if he is taught their history and habits in a simple way—with pictures or drawings if they can be procured. A child learns by touching and handling things and by asking questions, and every new thing he sees is full of interest for him. Mother is often too busy to answer questions, and so father can be very useful here. Always make a point of answering a child's questions yourself and answer them truthfully. If you do not know the answer tell him so and look for it with him in an encyclopædia or useful knowledge book. Share your child's interests, even if they pass quickly, because they are all a necessary part of his development and will leave their mark on his character.

Correct clothing is important for the health of the pre-school child. It is fortunate that these days there are so many fadeless boiling materials on the market. All clothes should be light in weight and hang from the shoulders with no tight bands or elastics to hamper breathing and movement and encourage the development of varicose veins. The clothes should be changed day by day according to the weather. Shoes and socks must always be big enough to give the foot full play and allow for growth, and it is important for grace of movement and good posture that the shoes have low heels and a straight line on the inner side of the foot.

The food of the growing child must be carefully chosen and cooked to preserve as much of its nourishment as possible. So important is the subject of food that next month we shall publish a special article on the food of the older child.

Lastly, we must mention sleep and rest for the toddler. As mother knows only too well he starts his day early. He wakes bright and eager and lives every moment of his day. Therefore, even if he does not sleep during the day he should have plenty of rest. One or two hours before the mid-day meal is necessary, and at least twelve hours unbroken sleep at night. Sleep refreshes the child's busy brain and helps the growth of his whole body, so watch carefully that he gets sufficient. Many toddlers do not. Do not allow over-stimulation by noise, bright lights or excitement at the end of his day. A simple story or a few tuneful lullabies at bed time while curled up in mother's or daddy's arms make a happy ending for a small boy or girl's busy day.

All of us who are concerned with the care of the pre-school child, parents, Child Welfare nurses, kindergarten teachers, &c., should "get together" and by exchanging knowledge and experience try to build up a generation who will be wiser and happier than ours.

Questions on this and any other subject concerning Maternal and Child Welfare will be answered by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

A HOLIDAY MIXTURE.

Custard Tart.

Line a sandwich tin or ovenproof tart plate with shortcrust and fill with the following:—Beat 2 eggs slightly, add 2 tablespoons sugar, vanilla, and 1½ cups cold milk. Rub bottom of pastry with egg-white and pour in custard very gently. Sprinkle top with a little nutmeg and place in hot oven for a few minutes, then lower heat a little and bake until pastry is set. Reduce the heat to slow and continue to bake until custard is set.

Steamed Apple Pudding.

Peel and chop 4 or 5 apples into dice. Melt 1 tablespoon butter in a saucepan, add apples, and fry a little, add 1 cup sugar and fry until apples change colour. In the meantime, sift 2½ cups plain flour with 2 teaspoons baking powder and a good pinch salt. Rub in 3 oz. margarine and 1 tablespoon sugar. Add enough milk to form a firm paste. Line a basin with paste, reserving enough for top. Fill with apples, and, if liked, a few raisins and a little minced mixed peel may be added. Cover with remaining paste, cover with buttered paper, and steam for 2 hours.

Baked Tomatoes.

Well grease a pie dish and put in a layer of tomatoes, peeled and cut into thick slices. Sprinkle with salt, pepper, a little sugar, and curry powder. Add a layer of well-boiled rice, then another layer of tomato, &c., having the top layer tomato. Cover top with buttered crumbs and bake slowly for half an hour. Serve with fingers of fried bread.

Banana Charlotte.

Line a round, buttered cake tin with fingers of buttered bread, taking care to overlap each other. Put a layer of sliced bananas in the bottom and cover with apricot jam, then a layer of banana, and so on, until the dish is full, piling it much higher in the centre. Cover with a layer of bread and butter, sprinkle with sugar, and bake in a hot oven for half an hour.

Fresh Pea Soup.

Cook together 2 lb. shelled peas, 1 large sliced onion, a little chopped parsley, 2 cups boiling water, salt, pepper, 1 teaspoon sugar. Simmer until tender with a hambone, if liked. Remove bone and rub vegetables through a sieve. Melt 1 tablespoon butter in a saucepan, add 1½ tablespoons flour, cook a little, then add 1 pint milk, and, if liked, 1 tablespoon cream. Add vegetable puree and stir well together. Thoroughly heat and serve with sippets of toast or fried bread.

Christmas Pudding.

Take ½ lb. breadcrumbs, ½ lb. raisins, 1 oz. citron peel, 1 grated carrot, ½ lb. brown sugar, ½ lb. muscatel raisins, ½ lb. shredded suet, 2 oz. lemon peel, 6 eggs, 2 nutmegs, ½ lb. currants, ¼ lb. orange peel, 3 oz. almonds, 6 oz. flour, 1½ gills ale, salt.

Mix the breadcrumbs, sugar, grated nutmeg, chopped raisins, cleaned currants, minced peels, and a pinch of salt together in a basin. Stir in the suet, then the blanched almonds. Add well-beaten eggs and remaining ingredients, without the ale. Beat for two or three minutes with a wooden spoon, then stir in the ale, cover, and leave for several days, stirring once daily. Pack into two buttered basins. Cover with buttered paper, then a floured cloth. Steam for seven or eight hours in a saucepan with boiling water coming half way up the sides. When required, cook for three hours, then turn out, sprinkle with vanilla sugar, decorate with a sprig of holly, and serve with brandy or rum custard.

Economical Christmas Pudding.

Take ½ lb. beef suet, ¼ lb. flour, ¼ lb. breadcrumbs, 6 oz. cleaned currants, 6 oz. stoned raisins, ¼ lb. brown sugar, ¼ lb. cooked carrot, ¼ lb. cooked potato, 2 oz. candied peel (finely shredded), 1 teaspoonful salt, 2 tablespoonfuls brown treacle.

Rub the carrot and potato through a sieve. Mix together all the dry ingredients with the sieved carrot and potato, and this will require time, as it is not easy to mix them well without moisture. Last of all stir in the treacle, after warming it until it runs. Mix very thoroughly, and keep in the mixing basin several days, stirring the pudding every day. Then put into a large basin (well greased), cover with greased paper and thick dry paper over all, and steam for six hours. When reheating, allow two hours for steaming through. Serve with brandy sauce or custard.

Almond Sauce.

Take ½ lb. ground almonds, 2 oz. castor sugar, 1 whole egg and 3 yolks, ¼ pint cream, ¼ pint milk, 1 wineglassful brandy, ½ teaspoonful essence of bitter almonds.

Pound the almonds and sugar together in a basin, and add the egg and egg-yolks (well beaten), then milk and cream by degrees. Turn into a jug, place this in a saucepan of hot water, and stir till the mixture thickens, which will take quite a quarter of an hour. Remove from the heat and continue stirring at intervals till nearly cold, add brandy and essence, and heat again in the saucepan before serving.

Brandy Sauce.

Take 2 oz. butter, 2 oz. flour, ½ pint milk, pinch of salt, sugar, brandy.

Dissolve the butter, and work into it the flour until perfectly smooth; then dilute with the milk, slightly warmed. Add the salt, and bring to the boil, stirring all the time. Boil for two minutes, then add a little thick cream or another pat of cold butter. Pour a wineglass of brandy over six lumps of sugar; when dissolved, stir into sauce, which should not boil again.

Punch Sauce.

Take 2 oz. sugar, 1 oz. butter, 1 teaspoonful rice flour, ½ wineglassful rum, ½ wineglassful marsala, ½ wineglassful brandy, lemon, orange, 1 gill water.

Put the sugar on to boil with the water, the rind of half a small lemon (pared very thinly), and a rather smaller quantity of orange-peel. Let them simmer for fifteen minutes, then take out the peel. Mix the rice flour quite smoothly with a little cold water, and stir into the boiling syrup. Add the butter in small pieces, then the strained juice of half the orange, also a teaspoonful of the lemon juice. Boil for ten minutes, then add the rum, marsala, and brandy, but do not let the sauce boil after they are added.

Hard Sauce.

Take 4 level tablespoonfuls of butter, 2 level tablespoonfuls castor sugar, 4 teaspoonfuls brandy, pinch of grated nutmeg.

Beat the butter to a cream, beat in the sugar, then the brandy and nutmeg. Heap the mixture in a glass dish, and put it on ice or in a cold place until required.

SUMMER FRUIT DRINKS.

Nothing is more refreshing or pleasing in warm weather than a well-prepared fruit drink, while from a health point of view the habit of drinking fruit juices needs no stressing. Their wholesomeness may be particularly emphasised as beverages for children, who, left to their own devices, are quick to acquire the taste for them. Many so-called orange and lemon drinks contain no fresh fruit at all, but are made from chemicals and artificial colouring matter. Not only do they not have the food value that the real fruit possesses, but they may be definitely injurious to the child's health.

The only drinks of this kind that the child should be permitted to have should be made from the fresh fruit juice. Mothers who make real fruit juice drinks for their children will not be teased for artificial soda and other harmful drinks. Fruit juices not only satisfy thirst; the natural fruit acids they contain supply beneficial elements to the child's diet.

Pineapple Drink.—Wash the skin of pineapple. Place in a lined saucepan with the core and enough cold water to cover. Cook slowly three-quarters of an hour. Add 3 tablespoons or more sugar and the juice of 1 orange or lemon. Strain and allow to cool. Chill and serve.

Fruit Punch.—Take ½ cup lemon juice, 1 cup orange juice, grated rind ½ orange, 1 tablespoon grated lemon rind, 1 quart water, 3 or 4 cups of sugar. Cook water and sugar for 3 minutes, cool and mix with orange and lemon juice, rind, &c. To this add the following ingredients:—(1) 1 quart ginger ale, ½ cup preserved ginger cut up finely, (2) 1 cup grated pineapple, 1 pint soda water.

Fruit Cup.—Take 2 lemons, 1 quart boiling water, 2 oranges, 4 passion-fruit, 1 ripe pear (if available), 4 tablespoons sugar, few drops cochineal. Wash lemons, peel thinly into a large jug or bowl; squeeze juice and place it in jug with rind and sugar; pour the boiling water over this and cover till cold. Strain into glass jug, colour very pale pink, add slices of oranges, passion-fruit pulp, and cut pear or other fruit. Place in ice chest and serve very cold.

IN THE FARM GARDEN.

USING RUBBISH IN THE HOME GARDEN.

DR. D. A. HERBERT.

There need be very little waste in the home garden. When the annuals are finished they can be turned into the soil to improve its texture and to return some of the plant foods that they have taken out. The best of them are the plants of the pea and bean family—sweetpeas, peas, beans, lupins, and the like. These are too good to be thrown on the rubbish heap and burnt. Scraps from the kitchen should be systematically buried, and any fallen leaves make a good mulch when spread under plants to help retain moisture in the soil. These materials in the course of their decay not only release their own plant foods, but help to make available what is already present in the soil by encouraging bacterial activity. Too often such material is thrown away or burnt. Generally speaking, the only vegetable rubbish from the kitchen or the garden that should not be turned into the soil is that which is diseased or contaminated with troublesome weeds. This can be burnt and the ash used as a soil dressing.

Now that potash is not available for the home garden, ash from the rubbish heap and other fires should never be wasted. It has quite a useful potash content, and is specially useful for roses and such plants in helping them to resist mildew. Bones should be burnt and they can then be broken down to a powder with the back of a spade and used as bonedust. The finer the powder, the more effective it is as a plant food. Ashes and powdered bones provide two of the three standard substances used as fertilizers—namely, potash and phosphate. The third, nitrogen, is deficient, but it may be supplied by animal manure or urine, the latter being diluted with about four times its volume of water.

Where it is inconvenient to adopt a regular programme of burying rubbish, a compost heap may be built. Vegetable trash is piled in a pit or an old tank, or even in a heap in some corner, and sprinkled liberally with lime. Successive layers are built up, each sprinkled in turn with lime and kept moist but not wet. The heap rots down to a valuable compost for the garden beds, especially if it is turned over with the fork from time to time. Where there are shrubs in the garden, grass clippings, fallen leaves, and the less troublesome types of weed can usefully be piled under them to form a heavy mulch to conserve moisture. In the course of time they will rot down and perform the further service of providing food material for the plants. Such a practice often produces unexpectedly good growth in the mulched plants.

There are certain materials which may find their way into household rubbish and which should not be put on the garden. Boracic acid and borax are very injurious. Borax is often used for controlling cockroaches, and if it is swept up and dumped on a garden bed will produce a barren patch. The same is true for most antiseptics and disinfectants though the effect may only be temporary. Salt solutions are injurious, though salt washes out of the soil readily and does not produce lasting ill-effects. Such solutions (corn beef water for example) may be poured on weed clumps to kill them.

PASTEURISATION.

The object of pasteurisation is, firstly, to make milk and milk products safe by destroying any disease germs that may be present; and, secondly, to improve the keeping quality of butter and cheese made from milk and cream so treated. Pasteurisation, however, has its limitations. It cannot perform miracles—such as improving the grade of cream from second to choice, or eliminating strong weed taints.

Most dairy farmers are aware of this, and know that the production of choice quality cream depends on the care and attention given on the farm, and that the pasteurisation process is beneficial in that a butter of choice quality can be manufactured to withstand long periods of cold storage.

THE ANSWER TO VIRGINIA.

Nearly forty years ago, the Editor of the New York "Sun" received a letter from little Virginia O'Hanlon—

"Dear Editor,

"I am eight years old. Some of my little friends say there is no Santa Claus. Please tell me the truth. . . ."

The answer to Virginia published in the "Sun" next day caused such nation-wide interest that the "Sun" has reprinted it every Christmas for nearly forty years—and this is the answer to Virginia:—

"Virginia, your little friends are wrong. They have been affected by the scepticism of a sceptical age. They do not believe except they see. They think that nothing can be which is not comprehensible by their little minds. All minds, Virginia, whether they be men's or children's, are little. In this great universe of ours man is a mere insect in intellect, as compared with the boundless world about him, as measured by the intelligence capable of grasping the whole of truth.

"Yes, Virginia, there is a Santa Claus. He exists as certainly as love and generosity and devotion exist, and you know that they abound and give to life its highest beauty and joy. Alas! How dreary would be the world if there were no Santa Claus! It would be as dreary as if there were no Virginias. There would be no childlike faith then, no poetry, no romance to make tolerable this existence. We should have no enjoyment, except in sense and sight. The eternal light with which childhood fills the world would be extinguished.

"Not to believe in Santa Claus! You might as well not believe in fairies! You might get your Papa to hire men to watch all the chimneys on Christmas Eve to catch Santa Claus, but even if they did not see Santa Claus coming down, what would that prove? Nobody sees Santa Claus, but that is no sign that there is no Santa Claus. The most real things in the world are those that neither children nor men can see. You tear apart a baby's rattle and see what makes the noise inside, but there is a veil covering the unseen world which not the strongest men, nor even the united strength of all the strongest men that ever lived, could tear apart. Only faith, fancy, poetry, love, romance can push aside that curtain and view the supernal beauty beyond. Is it real? Ah, Virginia, in all this world there is nothing else real and abiding.

No Santa Claus? Thank God! He lives and lives forever. A thousand years from now, Virginia, nay ten times ten thousand years from now, he will continue to make glad the heart of childhood."

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1941 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1941.	Oct., 1940.		Oct.	No. of years' records.	Oct., 1941.	Oct., 1940
North Coast	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	0·93	40	0·08	0·22	Gatton College	2·02	42	0·68	0·58
Cairns	2·11	59	0·05	1·68	Gayndah	2·38	70	1·23	0·08
Cardwell	1·99	69	0·04	0·30	Gympie	2·69	71	0·44	0·29
Cooktown	1·02	65	Nil	0·83	Kilkivan	2·69	60	0·70	1·30
Herberton	0·95	55	Nil	0·08	Maryborough	2·74	70	0·98	0·62
Ingham	1·82	49	0·15	0·28	Nambour	3·18	45	0·84	0·95
Innisfail	3·19	60	0·04	1·83	Nanango	2·22	59	0·40	0·93
Mossman Mill	2·95	28		0·89	Rockhampton	1·79	70	0·11	0·16
Townsville	1·21	24	Nil	0·18	Woodford	2·60	54	0.42	1·15
Central Coast.					*Central Highlands.*				
Ayr	0·89	54	0·16	Nil	Clermont	1·29	70	0·59	Nil
Bowen	0·98	70	Nil	0·24	Gindie	1·33	42	..	0·19
Charters Towers	0·72	59	0·91	Nil	Springsure	1·62	72	1·76	0·02
Mackay P.O.	1·70	70	0·08	0·04	*Darling Downs.*				
Mackay Sugar Experiment Station	1·44	44	..	0·16	Dalby	2·02	71	0·77	0·50
Proserpine	1·58	38	0·21	0·92	Emu Vale	2·15	45	0·50	0·90
St. Lawrence	1·77	70	0·48	0·06	Hermitage	1·95	36	..	0·71
					Jimbour	1·89	62	0·60	0·13
South Coast.					Miles	2·01	56	0·62	0·96
					Stanthorpe	2·48	68	1·32	1·17
Biggenden	2·48	42	1·73	0·28	Toowoomba	2·53	69	1·19	0·75
Bundaberg	2·10	58	1·43	0·50	Warwick	2·30	76	0·64	0·94
Brisbane	2·55	89	0·61	1·97					
Caboolture	2·73	65	1·00	3·25	*Maranoa.*				
Childers	2·74	46	1·89	0·92					
Crohamhurst	3·36	48	0·59	1·71	Bungeworgoral	1·35	27	0·66	Nil
Esk	2·62	54	0·65	1·43	Roma	1·71	67	0.76	0·24

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—OCTOBER, 1941.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	..	82	70	85	31	63	25, 26	Nil	..
Herberton	..	83	54	92	30, 31	38	2	Nil	..
Rockhampton	30·04	87	65	97	30, 31	55	2	11	5
Brisbane	30·05	79	61	89	30	52	3	61	7
Darling Downs.									
Dalby	..	84	56	99	21	38	3, 4	77	4
Stanthorpe	..	76	47	91	7, 21	30	3	132	7
Toowoomba	..	77	55	94	21	42	2	119	7
Mid-Interior.									
Georgetown	29·98	97	66	103	31	52	2	6	1
Longreach	29·97	95	63	106	22	39	2	45	3
Mitchell	30·00	86	56	100	21	34	2, 3	124	5
Western.									
Burketown	..	92	68	100	31	55	2, 3	Nil	..
Boulia	29·93	93	65	106	21, 22	44	3	29	3
Thargomindah	29·99	86	59	100	17	48	3	45	4